

## New series, subseries, species and subspecies of *Eucalyptus* (Myrtaceae) from Western Australia and from South Australia

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### Abstract

New series, subseries, species and subspecies of *Eucalyptus* (Myrtaceae) from Western Australia and from South Australia. Nuytsia 9 (1): 1-68 (1993). Three new series, six new subseries, twenty-two new species and twenty new subspecies of *Eucalyptus* are described. New taxa are treated in the order and nomenclature of the Flora of Australia Volume 19 (1988) from which we deviate only when we consider an updated treatment necessary. The new series *Falcatae* is erected and divided into two subseries, *Falcatae* and *Decipientes*. The series *Micrantherae* s.s. is expanded to include the new subseries *Bakerianae*, and a new series *Balladonienses* is erected. *E. lane-poolae* of series *Curviptera* is segregated in the new *E.* subseries *Inflexae*, *E. caesia* in the new *E.* series *Caesia*, while *E.* series *Orbifoliae* comprises the remaining Minni Ritchi species. A new subseries *Cupreanae* is erected in *E.* series *Lucasianae*. Diagnostic notes on each taxonomic series are given at the head of the relevant groups of species throughout the paper. The new taxa are illustrated, except for *E. ebbanoensis* subsp. *photina* and *E. marginata* subsp. *thalassica* for which leaf colour and leaf gloss are the diagnostic characters, *E. marginata* subsp. *elegantella* and *E. macrocarpa* subsp. *elachantha* for which habit, bark characters and leaf, bud and fruit dimensions are the diagnostic characters and *E. decipiens* subsp. *chalar* and *adesmophloia* for which bark characters only are diagnostic. Distribution maps are provided. All the new taxa are endemic to Western Australia except for *E. glomerosa* and *E. kingsmillii* subsp. *alattissima*, both of which extend into the desert region of South Australia.

### Introduction

This paper is the second in a series of three major papers in which we describe and classify various new *Eucalyptus* taxa, all but two of which in this paper are endemic to Western Australia. The first of these studies was a revision of *Eucalyptus redunca*, *E. wandoo* and related species (Brooker & Hopper 1991). A following paper will present a large-scale revision of the species related to *E. cornuta*. This current paper treats a large number of taxa spread over many taxonomic series.

We are not satisfied that any published formal classifications of the genus *Eucalyptus* adequately deal with many groups of species which we treat herein. Hence, we have erected new series and subseries where needed.

Our initial data are derived largely from our extensive field experience, the eucalypt collections in the Western Australian Herbarium (PERTH) and the CSIRO Division of Plant Industry (CANB) and from discussions with colleagues and other collectors. In addition, we have relied to a large extent upon glasshouse trials to complete the comparative morphological studies on seedling morphology.

Many of the new species occur over a relatively wide range and are in sufficient abundance or in protected areas that they are in no danger of extinction. Some are of restricted distribution in agricultural areas but their occurrence on land unsuitable for farming, e.g. lateritic breakaways, may save them and their associated vegetation from being cleared. One of the species of restricted distribution, *E. angularis*, produces apparently healthy buds and flowers but is not known to have set seed. Tests may indicate that the two populations are actually proliferations of single individuals, but its distinctiveness is worthy of taxonomic recognition.

Most of the descriptive terms used in the digests for species are explained and illustrated in Brooker & Kleinig (1990). It is of particular value to recognise the tree/mallet distinction, the latter being a habit form peculiar to Western Australia. For an account of our taxonomic concepts, materials and methods, and background information on studies on Western Australian eucalypts, see Brooker & Hopper (1991).

### Taxonomic treatment

*Eucalyptus* ser. *Ebbanoenses* Chippendale, Fl. Australia 19:497 (1988). Type: *E. ebbanoensis* Maiden.

The monotypic *E. ser. Ebbanoenses* belongs in the informal *E. subgen. Eudesmia* (R. Br.) Pryor & Johnson (1971). The series is diagnosed by the following: smooth-barked mallee, reniform cotyledons, hairy juvenile leaves, adult leaves with prominent side veins and no tertiary veining and with numerous island oil glands, axillary, 3-flowered inflorescences, stamens in 4 bundles, fruits with a broad level disc, 3 valves to rim level and smooth or lacunose black seeds.

### Key to taxa of *E. ser. Ebbanoenses*

- 1. Adult leaves dull ..... *E. ebbanoensis* subsp. *ebbanoensis*
- 1. Adult leaves glossy ..... 1. *E. ebbanoensis* subsp. *photina*

### 1. *Eucalyptus ebbanoensis* subsp. *photina* Brooker & Hopper, subsp. nov.

A subspecie typica foliis nitentibus differt.

Typus: Nanson Road, 28°34'S, 114°43'E, 12 Mar. 1986, M.I.H. Brooker 9195 & S.D. Hopper (holo: PERTH; iso: CANB, NSW, MEL).

It differs from the typical subspecies in the very glossy adult leaves.

*Other specimens examined.* WESTERN AUSTRALIA: 13 miles E of Eradu Siding, 26 Oct. 1974, J.S. Beard 7160 (PERTH); Burma Road Nature Reserve, 26 Jan. 1983, M.I.H. Brooker 7944 (CANB, PERTH); breakaway SSE of Mt Horner, 4 Feb. 1985, M.I.H. Brooker 8817 (CANB, PERTH); Nanson Road, 12 Mar. 1986, M.I.H. Brooker 9195 (CANB); Mt Michael, 12 Mar. 1986, M.I.H. Brooker 9196 (CANB); c. 500 m SE of Mt Michael (28°55'S, 114°58'E), 12 Mar. 1986, M.I.H. Brooker 9199 & S.D. Hopper (CANB, MEL, NSW, PERTH); 17.7 km E of Burma Road on road to Walkaway, 17 Mar. 1986, M.I.H. Brooker 9201 (CANB); 3.7 miles E of Eradu Siding, 17 Mar. 1968, G.M. Chippendale 323 (CANB, PERTH); 4.4 km NE of Moonyoonooka turn-off from Nanson-Geraldton Road, Heinrich's farm, East Morseby Range, 25 Aug. 1983, R.J. Cranfield 2937 (CANB, PERTH); 27 miles E of Walkaway, 4 Sep. 1966, A.S. George 7854 (PERTH); Royce's farm, Howatharra, NE of Geraldton, 27 Aug. 1980, G.J. Keighery 3208 (PERTH); 4.2 km S of Nanson on Murphy Norris Rd, 28°36'S, 114°46'E, 18 July 1989, A. Napier & A. Kelly 508 (CANB, PERTH); Gravel pit on Mullewa Rd opposite Wicherena Water Res., 19 July 1989, A. Napier & A. Kelly 510 (PERTH); 11.2 km S down Casuarina Rd from Geraldton-Mullewa Rd, 19 July 1989, A. Napier, A. Kelly & P. Ryan (PERTH); 76 miles E of Geraldton, 26 Oct. 1974, E. Wittwer W1577 (PERTH).

*Distribution.* North and east of Geraldton, particularly in the Morseby Range on breakaways, Western Australia (Figure 1).

*Conservation status.* Uncommon but secure in some conservation reserves, and in need of monitoring (Priority 5 in Hopper *et al.* (1990)).

*Flowering period.* Unknown.

*Etymology.* From the Greek *photeinos* - shiny, as descriptive of the leaves compared to the widespread typical form.

*Notes.* The typical subspecies has a remarkably wide distribution in contrasting environments from near Geraldton eastwards to the Great Victoria Desert while subsp. *photina* is restricted to lateritic breakaways in the vicinity of the Moresby Range and Eradu and south to Walkaway and Mt Michael. It grows with *E. arachnaea* Brooker & Hopper.

***Eucalyptus* ser. *Occidentales*** Blakely, "A Key to the Eucalypts" 40, 171 (1934).

*Lectotype* (*fide* Chippendale 1988): *E. marginata* Donn ex Smith

The *E.* series *Occidentales* belongs in the informal *E.* subgenus *Monocalyptus* Pryor & Johnson. In Blakely (1934) the series comprised *E. sepulchralis*, *E. buprestium*, *E. staeri* and *E. marginata*. In Chippendale (1988) it is made up of *E. brevistylis*, *E. jacksonii*, *E. marginata* (lectotype there chosen) and *E. staeri*. In a recent informal classification of Western Australian *Monocalyptus* (Ladiges *et al.* 1987) these species were divided between different sections. We believe, therefore, that the *Occidentales* as defined by Blakely and by Chippendale are not a natural group and it would be exceeding the purpose of this paper to provide a key to a large, arbitrary group of species. The following two new subspecies are a division of the type species for the series.

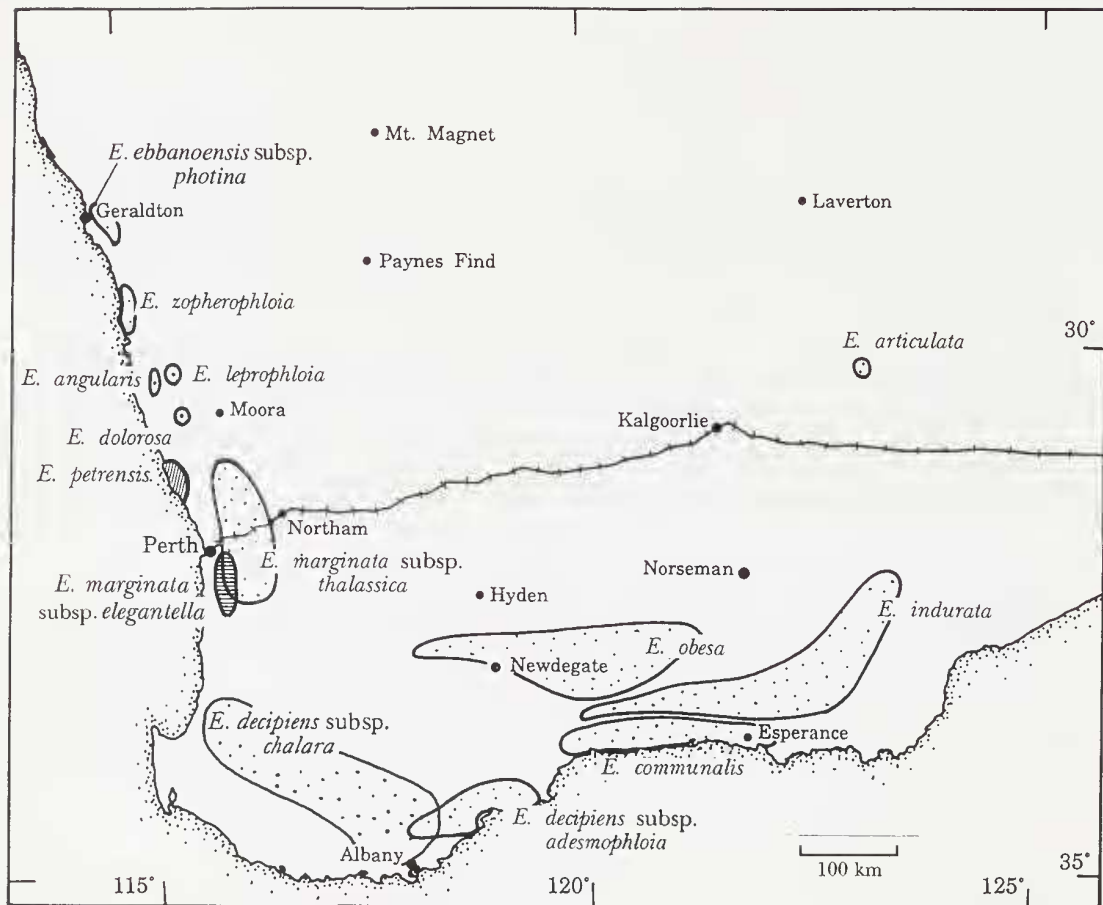


Figure 1. Distribution of taxa Nos 1-13

### Key to subspecies of *E. marginata*

1. Adult leaves glossy, green to dark green
  2. Adult leaves broadly lanceolate, >10 x 2 cm ..... *E. marginata* subsp. *marginata*
  2. Adult leaves lanceolate, <10 x 2 cm (often <1.5 cm wide) .. 2. *E. marginata* subsp. *elegantella*
1. Adult leaves dull, grey to bluish ..... 3. *E. marginata* subsp. *thalassica*

### 2. *Eucalyptus marginata* Donn ex Smith subsp. *elegantella* Brooker & Hopper, subsp. nov.

A subspecies typica foliis adultis parvioribus angustioribus et habitu parviore compacto differt.

*Typus:* Darling Scarp, ca. 3 km due west of Jarrahdale, Atkinson's property, 32°20'S, 116°01'E, 30 Mar. 1991, S.D. Hopper 7916 (holo: PERTH; iso: CANB, NSW).

It differs from the typical subspecies by the smaller, narrower adult leaves (to 9 x 2 cm but often <1.5 cm wide) and smaller more compact habit.



*Other specimens examined.* WESTERN AUSTRALIA: Forrestfield, 10 Nov. 1965, A.S. George s.n. (PERTH); 4 km SSW of Serpentine, 5 Aug. 1982, G.J. Keighery 5043 (PERTH); type locality, 30 Mar. 1991, S.D. Hopper 7917 (PERTH).

*Distribution.* Apparently confined to the foot of the Darling Scarp between Perth and Serpentine on Ridge Hill Shelf lateritic loams (Figure 1).

*Conservation status.* Poorly known.

*Flowering period.* Late spring-early summer.

*Etymology.* The diminutive of the Latin *elegans* (elegant) in reference to the fine leaves and small habit compared with the typical form of jarrah.

*Notes.* *E. marginata* subsp. *elegantella* is a compact small tree, usually less than 8 m tall, with characteristically narrow leaves. It is conspicuous along the South West Highway southwards from Byford. It appears to be confined to granitic clays associated with the slope and foot of the Darling Scarp. It often occurs with *E. calophylla* and sometimes with *E. lane-poolae*.

### 3. *Eucalyptus marginata* Donn ex Smith subsp. *thalassica* Brooker & Hopper, subsp. nov.

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 100 (1990).

A subspecies typica foliis adultis thalassicis et constanter habitu umbrato differt.

*Typus:* Baker's Hill, 34°45'S, 116°27'E, 27 Aug. 1979, M.I.H. Brooker 6496 & E. Bettenay (holo: PERTH; iso: CANB, NSW).

Differing from the typical subspecies in the grey or bluish adult leaves and consistently umbrageous habit.

*Other specimens examined.* WESTERN AUSTRALIA: type locality, 27 Aug. 1979, M.I.H. Brooker 6497, 6498, 6499 (CANB, NSW, PERTH); between Hay Flat and Bindoon, 28 Aug. 1983, M.I.H. Brooker 8286 (CANB, PERTH); Kardinya, ± 9 miles S of Perth, 4 Feb. 1969, A.S. George 9249 (PERTH); Above S side of McKnoe Creek, 32°54'S, 115°58'E, 24 Oct. 1988, L. Johnson 9125 & B. Briggs (CANB, NSW, PERTH); 2.5 km W of junction of Great Southern & Great Eastern Hwys, 31°53'S, 116°17'E, 3 Nov. 1988, L. Johnson 9211 & B. Briggs (CANB, NSW, PERTH); Bartlett's Well, 25 km N of Gin Gin, 27 Jan. 1987, G. Keighery 9853 (PERTH); Clackline, 20 km W of Toodyay, 19 Sep. 1988, G.J. Keighery 10526 (CANB, PERTH); 22 mile peg Albany Highway, 13 July 1970, B. Rockel (FRI 18672) (CANB); Jarrahdale, 8 Feb. 1928, W.R. Wallace s.n. (CANB).

*Distribution.* The northern Darling Range, Western Australia (Figure 1).

*Conservation status.* Common and widespread.

*Flowering period.* As for the typical subspecies - early summer.

*Etymology.* The name refers to the colour of the leaf (Greek *thalassicos* - sea-coloured).

*Notes.* *E. marginata* subsp. *thalassica* is the common form of jarrah in most of its northern Darling Range distribution (the new taxon does not occur in the Mt Lesueur area) and is readily seen along the roads to New Norcia and Northam and along the Brookton Highway. In the Bakers Hill area it has a notably pendulous habit of the branches. Despite its abundance, it is poorly represented in herbaria.

### Two monocalypts of uncertain affinity

In the most recent classification of the western monocalypts, Chippendale (1988) used seven taxonomic series, three of which are monotypic and the remainder we believe to be heterogeneous. The following two new monocalypts cannot be placed in this classification.

The previous year (1987) Ladiges *et al.* produced an informal system based on a study of 40 characters of the seed, cotyledons, seedlings, habit, adult leaves, flowers and fruit. Because of limited material, we cannot place *E. angularis* in this system. *E. dolorosa*, on the other hand, fits in the weakly resolved clade comprising the informal superseries "*Bupresticae*" and "*Todtianicae*" and, with further material available to us, we elaborate later on its taxonomic relationships.

#### 4. *Eucalyptus dolorosa* Brooker and Hopper, sp. nov. (Figure 2)

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 418 (1990).

Frutex ("mallee") ad 2.5 m altus cortice in caulibus maturis fibroso. Folia adulta petiolata, lanceolata vel raro falcata, ad 10 x 2 cm, concoloria, leviter nitentia, viridia; laterinervi costae concatenati visi; reticulum moderate densum venis tertiariis finitis quaternariis apparenter incompletis; glandulae numerosae discretae. Inflorescentiae axillares atque non ramosae vel fasciculatae in extremitatibus efoliosis ramulorum; pedunculi plus minusve tereti, ad 1.5 cm longi ferentes 7-flores. Alabastra in pedicellis longis, rhomboidea, ad 0.9 x 0.6 cm, operculo leviter rostrato singulo. Stamina numerosissima (circa in quoque alabastro 300), varie inflexa, omnia fertilia; antherae dorsifixae, versatiles, oblongae, rimis longitudinalibus dehiscentes, glande prominenti, terminali. Stylus glandifer; stigma apparenter lobum. Ovula verticaliter 2-seriata. Fructus in pedicellis ad 0.7 cm longis, cupulati vel truncati-globosi, leviter contracti ad summum, latiores quam longiores, ad 1 x 1.4 cm.

*Typus:* Mt Misery, 30°41'S, 115°37'E, 18 Aug. 1987, M.I.H. Brooker 9774 & P.M. Grayling (holo: PERTH; iso: AD, CANB, MEL, NSW).

*Mallee* to 2.5 m tall with thin, outer grey and inner yellowish, rough bark on older stems. *Juvenile leaves* petiolate, alternating, broadly falcate, to 11 x 4.5 cm, dull, conspicuously light bluish grey. *Adult leaves* petiolate, alternating, lanceolate or rarely falcate, up to 10 x 2 cm, concolorous, slightly glossy, green; side veins seen to be linked with the midrib (*cf. E. lateritica*); reticulation moderately dense with finite tertiary and incomplete quaternary veining; oil glands numerous, several per areole, island. *Inflorescences* axillary and unbranched usually clustered at the leafless ends of branchlets; peduncles more or less terete, up to 1.5 cm long with 7 flowers. *Buds* on long pedicels up to 1 cm long, rhomboid, up to 0.9 x 0.6 cm, with a single slightly beaked operculum. *Stamens* very numerous (c. 300 per bud), variously flexed, all fertile; anthers dorsifixed, versatile, oblong, dehiscing by longitudinal slits, with a prominent terminal gland. *Style* glandular; stigma apparently lobed. *Flowers* white. *Ovules* in 2



Figure 2. *E. dolorosa*- buds and leaves (MIHB 9873), and fruits (L. Sweedman 5724)

vertical rows. *Fruit* on pedicels to 0.7 cm long, cupular to truncate-globose and slightly contracted at the rim, wider than long, to 1 x 1.4 cm; valves 4, to rim level. *Seed* brown, pyramidal, winged, with terminal hilum.

*Other specimens examined.* WESTERN AUSTRALIA: Type locality. 18 Aug. 1987, M.I.H. Brooker 9741, 9742, 9743 (CANB); 3 Dec. 1987, M.I.H. Brooker 9829 (CANB, PERTH); 1 Feb. 1988, M.I.H. Brooker 9873 (CANB), 9874 (MEL), 9875 (NSW); 3 Mar. 1988, M.I.H. Brooker 9891 (CANB, PERTH); 14 Feb. 1991, L. Sweedman 5724 (KP, PERTH).

*Distribution.* Mt Misery, between Cataby and Dandaragan, Western Australia, where it occurs within a hectare including the flat mesa top and the southern slope in 5 or 6 clumps, each consisting of several apparent individuals (Figure 1).

*Conservation status.* Vulnerable, confined to a single remnant of native vegetation on private land left uncleared by the current owners for soil and nature conservation. Declared as Rare Flora (Hopper *et al.* 1990).

*Flowering period.* March.

*Etymology.* The specific epithet simply alludes to the only known occurrence of this species, viz. Mt Misery (Latin, *dolorosus* - sorrowful).

*Notes.* In Feb. 1991 *E. dolorosa* was found in fruit for the first time by Luke Sweedman and Roger Fryer of Kings Park and Botanic Garden, having flowered without producing fruit in the previous four years following its discovery. The size and shape of the fruit do not indicate any obvious affinity with other species of western monocalypts. The seed, however, are winged and this feature places *E. dolorosa* with *E. buprestium*, *E. erectifolia*, *E. lateritica*, *E. todiana*, and *E. johnsoniana* (these making a clade in Ladiges, Humphries and Brooker 1987). Only four seeds were harvested in the recent collection. Germination and seedling study have not yet been made to seek further indications of affinity.

Adult leaf venation and oil gland characters were not studied in Ladiges *et al.*, but they shed some light on this previously unresolved clade. *E. buprestium* and *E. erectifolia* are very similar in these leaf characters (strong tertiary venation and obscure or no oil glands), with *E. todiana* closely similar to them. The remaining three species, having distinct oil glands in the leaves, are divergent. *E. lateritica* and *E. dolorosa* have many oil glands and the most reduced tertiary venation. *E. johnsoniana*, with a distinct reticulation of tertiary veinlets and distinct oil glands, may lie in between.

*E. dolorosa* persists on a refugial site similar to species such as *E. suberea* and *E. lateritica* in Mt Lesueur National Park. It is probable that *E. dolorosa* is a relict species barely surviving extinction due to drying climate in the late Pleistocene.

## 5. *Eucalyptus angularis* Brooker & Hopper, sp. nov. (Figure 3)

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 418 (1990).

Frutex "mallee" ad 3 m altus cortice aspera vel squamea cinerea ad basin vel ad 1 m. Ramulosae exiles angulares. Folia adulta petiolata alternantia, elliptica vel falcata vel lanccolata, attentuata saepe uncinata, 6-10 x 1.5 cm, plus minusve concoloria sed aspectu leviter dorsiventrali marginibus minute recurvatis. Inflorescentiae axillares non ramosae, ad 11-florae. Pedunculi exiles, angulati vel complanati, ad 1.2 cm longi. Alabastra pedicellata, fusiformia, matura non visa. Ovula verticaliter 2-seriata. Fructus seminaque non visa.

*Typus:* Mt Benia, SW slope, 30°14'S, 115°16'E, 3 Mar. 1983, *M.I.H. Brooker* 8013 & *S.D. Hopper* (holo: PERTH; iso: CANB, NSW).

*Mallee* to 3 m tall with rough or flaky grey bark at the base only or up to 1 m. *Branchlets* slender, angular. *Juvenile leaves* not seen. *Adult leaves* petiolate, alternating, elliptical to falcate or lanceolate, tapering to a fine point, sometimes uncinata, 6-10 x 1.5 cm, more or less concolorous, but appearing slightly dorsiventral by the minutely recurved edges, glossy, green; reticulation dense with finite tertiary and incomplete quaternary veining, oil glands numerous, small, island and intersectional. *Inflorescences* axillary, unbranched, to 11-flowered. Two principal *bracts* prominent early in inflorescence development by the strongly beaked tips. *Peduncles* slender, angular or flattened, 1-2 cm long. *Buds* pedicellate, fusiform, not seen mature. Some outer *stamens* erect, others variously flexed. *Anthers* probably opening by non-confluent slits. *Flowers* not seen. *Ovules* in 2 vertical rows. *Fruit* and *seed* not seen.

*Other specimen examined.* WESTERN AUSTRALIA: W side of canyon, NE of Mt Lesueur, 1 Mar. 1983, *M.I.H. Brooker* 7984 & *S.D. Hopper* (CANB, NSW, PERTH).

*Distribution.* Known only from the two localities cited, both lateritic breakaways, where it consists at both sites as a single clump of mallees emergent in low heath (Figure 1).



Figure 3. *E. angularis* - adult leaves and young bud clusters (x0.5) (MIHB 7984)

**Conservation status.** Vulnerable, with one clump in Mt Lesueur National Park. Its possible hybrid origin has precluded listing on the schedule of Declared Rare Flora under current Conservation & Land Management policy (Hopper *et al.* 1990).

**Flowering period.** Unknown.

**Etymology.** From the Latin *angularis*, angular, referring to the branchlets.

**Notes.** *E. angularis* appears to have affinity with no other western monocalypt. The small, slightly dorsiventral, glossy, green, often falcate adult leaves resemble somewhat those of the eastern stringybarks (*E. ser. Pachyphloiae*) but the dense veining of the leaves suggests no affinity to these species. There is a possibility that it is an extremely rare hybrid of *E. marginata* and perhaps *E. exilis* or *E. pendens*. However, this hypothesis requires detailed investigation.

**Eucalyptus ser. Accedentes** Chippendale, Fl. Australia 19:495 (1988). *Type:* *E. accedens* W. Fitzg.

The *E. ser. Accedentes* belongs in the informal *E. subgenus* *Symphyomyrtus* (Schauer) Pryor & Johnson. It is diagnosed by the following: cotyledons bisected, pith of branchlets glandular, juvenile leaves petiolate, inflorescences axillary, unbranched, 7 or more flowered, stamens inflexed, anthers versatile, dorsifixed, oblong, opening by longitudinal slits, ovules in 4 vertical rows on placenta, seed grey to grey-brown, compressed-ovoid to flattish, slightly flanged and smooth to slightly reticulate.



### Key to species of *E. ser. Accedentes*

1. Tree
  2. Bark pink to white; leaves lanceolate to broadly lanceolate, blue-grey to blue-green ..... *E. accedens*
  2. Bark yellow to white; leaves lanceolate to falcate, green ..... *E. laeliae*
1. Mallee
  3. Leaves dull, grey to blue-grey ..... *E. trivalvis*
  3. Leaves glossy green,
    4. Bark rough, tightly held over most of stems ..... 6. *E. zopherophloia*
    4. Bark rough at butt or loosely rough or wholly smooth
      5. Branchlets, buds, fruit glaucous ..... *E. pruiniramis*
      5. Branchlets, buds, fruit not glaucous
        6. Erect-stemmed mallee with loose flaky rough bark; fruit cupular to barrel-shaped (to 0.7 x 0.6 cm) ..... 7. *E. leprophloia*
        6. Spreading mallee with mostly smooth stems
          7. Valves of fruit exserted, fruit obconical, to 1.2 x 1.3 cm ..... *E. prominens*
          7. Valves of fruit enclosed; fruit cylindrical, to 1.5 x 0.9 cm ..... *E. pilbarensis*

### 6. *Eucalyptus zopherophloia* Brooker & Hopper, sp. nov. (Figure 4)

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 127 (1990).

Frutex "mallee" ad *Eucalyptum* seriem *Accedentes* Chippendale pertinens, habitatione calcareo, habitu "mallee" effuso, cortice basi non-decorticato firmo, foliis adultis viridibus nitentibus distinguitur.

*Typus*: 31.7 km N of Coolimba on Cliff Head Road, 29°33'S, 114°58'E, 2 Nov. 1986, *M.I.H. Brooker* 9560 (holo: PERTH; iso: CANB, NSW).

Spreading *mallee* to 4 m tall with rough, grey-black, firm, fibrous *bark* on lower half or over whole of stems. Forming *lignotubers*. *Cotyledons* bisected. *Seedling leaves* petiolate, decussate, remaining opposite for 4-6 pairs, lanceolate to broadly lanceolate, to 6 x 3 cm, blue-green, dull. *Adult leaves* petiolate, alternating, narrowly lanceolate, to 10 x 1.3 cm, concolorous, dull to slightly glossy, light green; reticulation sparse to moderate, with numerous, large island oil glands. *Inflorescences* axillary, unbranched, to 11-flowered; peduncles slightly angular to flattened, 0.3-1.3 cm long. *Buds* pedicellate, ovoid to clavate, to 0.8 x 0.4 cm; bi-operculate; inner operculum hemispherical to shallowly conical, slightly shorter than hypanthium. *Flowers* creamy-white. *Ovules* in 4 vertical rows. *Fruits* pedicellate, obconical or less often cupular, to 1 x 1 cm; rim thin; disc descending; valves (3)4, to just below rim level.

*Other specimens examined*. WESTERN AUSTRALIA: 7.6 km S of Dongara-Mingenew Road on Brand Highway, 20 Aug. 1982, *M.I.H. Brooker* 7575 (CANB, PERTH); Cliff Head Road at rail crossing, 24 Jan. 1983, *M.I.H. Brooker* 7931 (CANB, PERTH); Cliff Head Road, west of Brand Highway (20°28'S, 115°01'E), 23 Jan. 1986, *M.I.H. Brooker* 8403 & *S.D. Hopper* (CANB, NSW, PERTH); Cliff Head Road turn-off on Brand Highway, 28 Aug. 1984, *M.I.H. Brooker* 8634 (CANB,



PERTH); 2.1 km N of Cliff Head Road turn-off on Brand Highway, 4 Feb. 1985, *M.I.H. Brooker* 8821, 8824, 8825 (CANB); Brand Highway, Cliff Head Road turn-off, 3 Feb. 1985, *M.I.H. Brooker* 8826, 8827, 8828, 8829, 8830 (CANB); c. 300 m S of Cliff Head turn-off on Brand Highway, 6 May 1986, *M.I.H. Brooker* 9264 (CANB, PERTH); c. 200 m S of Cliff Head turn-off on Brand Highway, 8 May 1986, *M.I.H. Brooker* 9279 (CANB, PERTH); Brand Highway, 0.4 km S of Cliff Head turn-off, west of road, 21 July 1986, *M.I.H. Brooker* 9394, 9395, 9396, 9397, 9398 (CANB); 28.3 km N of Coolimba on Cliff Head Road, 21 Nov. 1986, *M.I.H. Brooker* 9559 (CANB, PERTH); Cliff Head Road, west of Brand Highway (29°28'S, 115°01'E), 23 Jan. 1984, *M.I.H. Brooker* 8403 and *S.D. Hopper* (CANB, NSW, PERTH); 5 miles from turn-off to Eneabba, W of Three Springs, 15 Mar. 1968, *S.G.M. Carr* 355 (PERTH); 13.9 miles from Eneabba turn-off on Eneabba Road, 15 Mar. 1968, *S.G.M. Carr* 358, 359 (PERTH); 3 km S of junction of Three Springs West Road with Eneabba-Mingenew Rd, 20 Oct. 1982, *J. Coleby-Williams* 271A (PERTH); 5 km on Cliff Head Road, 28 Oct. 1978, *H. Demarz* 7154 (PERTH); 43 mile peg Geraldton-Mullewa (c. 69 km E of Geraldton towards Mullewa, 8 May 1964, *A.R. Fairall* 1481a (PERTH); Cliff Head turn-off, Brand Highway, S of Dongara, 6 Nov. 1975, *A.S. George* 14210 (PERTH); 2.6 km E of Greenhead-Leeman Bodycoat Road, 26 km W of Eneabba, 19 Sep. 1983, *S.D. Hopper* 3386 (PERTH); 1.7 km E of Brand Highway, 20 Sep. 1983, *S.D. Hopper* 3392 (PERTH); 13 km N of Coolimba on road to Cliff Head, 29°44'30" S, 114°58'40" E, 11 May 1989, *A. Napier & A. Kelly* 433 (PERTH); 2 km E of Brand Highway junction along Mt Adams road, 20 Feb. 1989, *P. Roberts* 906 (PERTH); 7 miles along Eneabba Road from Geraldton Highway, 1 Mar. 1966, *E.M. Scrymgeour* 264 and *S.G.M. Carr* (PERTH); 6 miles N of Green Grove-Arrowsmith River, 1952, *N.H. Speck* 7081 (PERTH).

*Distribution.* Coastal, on calcareous sand between Arrowsmith and White Point, Western Australia (Figure 1) and associated with *E. erythrocorys*, *E. foecunda*, *E. obtusiflora*, *Acacia rostellifera* and *A. xanthina*.

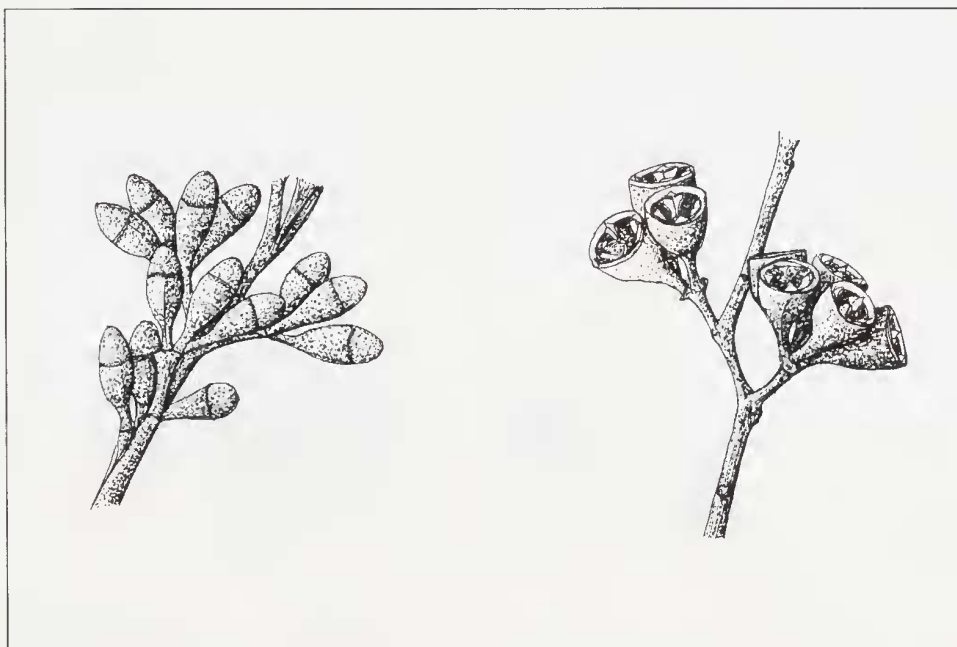


Figure 4. *E. zopherophloia* - buds (MIHB 9560) and fruit (MIHB 8825)

*Conservation status.* Uncommon but adequately surveyed and in need of monitoring (Priority 5 in Hopper *et al.* (1990)).

*Flowering period.* November-January.

*Etymology.* The name refers to the dark, rough bark (Greek *zopheros* - dusky and *phloia* - bark).

*Notes.* *E. zopherophloia* occurs in reasonable abundance south of Cliff Head but is more accessible on the Brand Highway about 200-300 m south of the turn-off to Cliff Head. In the immediate vicinity of this corner, it may be confused with *E. loxophleba* Benth. with which it probably hybridises. *E. loxophleba* always has very glossy leaves with the intramarginal vein remote from the margin. The oil glands in the leaves of *E. loxophleba* are smaller and more numerous.

## 7. *Eucalyptus leprophloia* Brooker & Hopper, sp. nov. (Figure 5)

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 128 (1990).

Frutex "mallee" *Eucalypto zopherophloiae* Brooker & Hopper affinis aqua habitatione non calareo, habitu erecto, cortice ad basin laxe squamoso non fibroso, foliis adultis angustis, glandulis oleosis apparenter intersectionibus, et fructibus parvioribus (ad 0.7 x 0.6 cm) saepissime cupulatis differt.

*Typus:* Hi-Vallee farm, N of Badgingarra, 30°07'S, 115°24'E, 16 July 1986, *M.I.H. Brooker* 9392 (holo: PERTH; iso: CANB, MEL, NSW).

Erect *mallee* to 5 m tall with scaly, curly partly decorticated rough but not fibrous bark to 1 m, smooth grey over pale coppery above. Forming *lignotubers*. *Cotyledons* bisected. *Seedling leaves* petiolate, decussate, remaining opposite for 4 or 5 pairs, ovate to deltoid, to 8 x 6 cm, light green to bluish green, dull. *Adult leaves* alternating, petiolate, lanceolate, to 14 x 2.5 cm, concolorous, dull; reticulation dense, incomplete, with numerous, mostly intersectional oil glands. *Inflorescences* axillary, unbranched, to 11-flowered; peduncles flattened, to 1 cm long. *Buds* pedicellate, ovoid, to 0.7 x 0.4 cm, bi-operculate; inner operculum hemispherical to obtusely conical, slightly shorter than hypanthium. *Flowers* creamy-white. *Ovules* in 4 vertical rows on placenta. *Fruits* shortly pedicellate, cupular, to 0.7 x 0.6 cm; rim thin to moderately thick; disc descending; valves 3 or 4, to rim level.

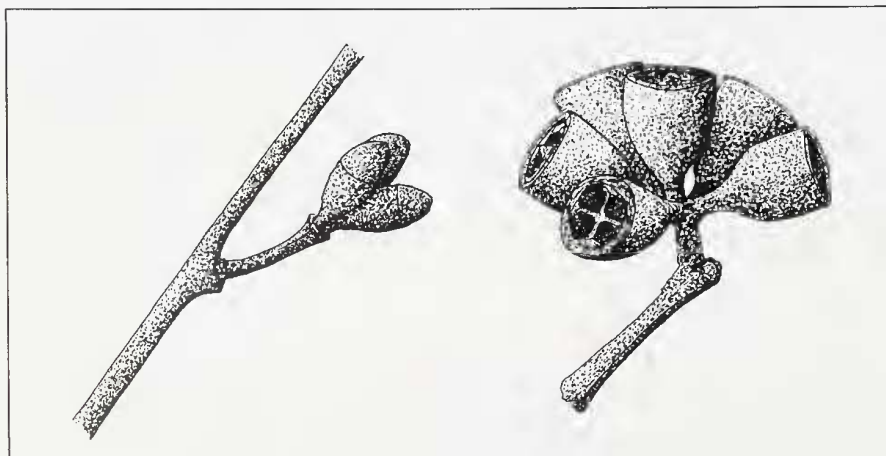


Figure 5. *E. leprophloia* - buds (MIHB 9392) and fruit (MIHB 8823)

*Other specimens examined.* WESTERN AUSTRALIA: Type locality, 19 Aug. 1982, *M.I.H. Brooker* 7567 (CANB, PERTH) and 21 Sep. 1982, *M.I.H. Brooker* 7648, 7649 (CANB, PERTH); 4 Feb. 1985, *M.I.H. Brooker* 8823 (CANB, PERTH); Mt Benia - E of Jurien Bay, 2 May 1991, *R.J. Cranfield & P.J. Spencer* 8010 (PERTH); 6 km SE of Mt Adams, 29 km WSW of Yandanooka Siding, 36 km SE of Dongara, 29°24'S, 115°16'E, 15 Nov. 1979, *S.D. Hopper* 1549 (PERTH); Hi Vallee Farm, N of Tootbardi Rd, 28 Feb. 1991, *S. Patrick* 523 & *A. Brown* (PERTH); Hutchinson's property, E side of Natha road, S of Mingenew, Sep. 1989, *P.C. Ryan* 29 (PERTH) and 27 May 1991, *P.C. Ryan s.n.* (CANB, PERTH).

*Distribution.* Known only from three disjunct stands, one (type locality) of approximately 30 individuals in a valley between lateritic breakaways (Figure 1), and the other of a few clumps on subdued valley slopes in a low woodland of *E. accedens*.

*Conservation status.* Declared as Rare Flora (Hopper *et al.* 1990). Two populations are on private nature reserves, the other on vacant Crown Land proposed as a Nature Reserve.

*Flowering period.* August-October.

*Etymology.* The name refers to the scaly basal bark (Greek *lepros* - scaly and *phloia* - bark).

*Notes.* While *E. leprophloia* is related to *E. zopherophloia*, the two species do not occur together, occupying lateritic and calcareous soil respectively. They may be distinguished by bark character and the oil gland patterns in the leaves, intersectional in *E. leprophloia* and island in *E. zopherophloia*.

**Eucalyptus ser. Loxophlebae** Chippendale, Fl. Australia 19:500 (1988)

*Type:* *E. loxophleba* Benth.

The *E. ser. Loxophlebae* belongs in the informal *E. subgen. Symphyomyrtus*. It is diagnosed by the following: cotyledons bisected, pith of branchlets glandular, juvenile leaves petiolate, inflorescences forming on leafless ends of branchlets with delayed development of terminal vegetative shoot, unit inflorescences 7 to 11-flowered, stamens inflexed and strongly "elbowed", anthers versatile, basifixed, cuboid, opening by pores, ovules in 4 vertical rows on placenta, style constricted at base, seed grey-brown, compressed-ovoid with shallow distinct reticulum.

Key to species of *E. ser. Loxophlebae*

1. Bark rough for 1 m or more on trunk or stems
2. Style articulate ..... *E. sp.* M\*
2. Style not articulate
3. Rough bark persistent to small branches ..... *E. loxophleba* subsp. *loxophleba*
3. Rough bark on lower part of trunk only ..... *E. loxophleba* subsp. *supralaevis*
1. Bark smooth, or rough to 0.5 m

\*A recently discovered species near *Marymia*, north-east of Meekatharra, to be described by others.

4. Intramarginal vein close to leaf edge; tertiary veining absent or obscure; fruit to 0.4 x 0.3 cm ..... *E. blaxellii*
4. Intramarginal vein well removed from leaf edge; tertiary veining distinct; fruit >0.4 x 0.3 cm
5. Buds to 1.5 x 0.5 cm ..... *E. loxophleba* subsp. *gratae*
5. Buds to 0.9 x 0.4 cm
6. Style articulate ..... 8. *E. articulata*
6. Style not articulate ..... *E. loxophleba* subsp. *lissophloia*

## 8. *Eucalyptus articulata* Brooker & Hopper, sp. nov. (Figure 6)

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 418 (1990).

Frutex "mallee" effusus ad *Eucalyptum* seriem *Loxophlebas* Chippendale pertinens, ad 2.5 m altus cortice laevi et caulibus deficienti glaucedinem. Folia plantularum petiolata, opposita per 4 vel 5 nodos, ad 8 x 4 cm, hebetia, thalassica, post demum alternantia, leviter nitentia, viridia. Folia adulta petiolata, alternantia, lanceolata, ad 11 x 1.5 cm, concoloria, nitentia, viridia. Inflorescentiae axillares non ramosae, saepe fasciculatae in extremitatibus ramulorum non foliosis. Pedunculi moderate validi, ad 1.5 longi, alabastra basi in pedicellum validum decrescentia, clavata, ad 0.8 x 0.4 cm. Stamina valde inflexa. Stylus basi decrescens et in fovea insertus, plus minusve articulatus. Fructus pedicellati, obconici, ad 0.9 x 0.7 cm, 3, 4 vel 5 valvis.

*Typus*: 22 km E of Mulga Rock, Great Victoria Desert, 30°09'S, 123°17'E, 25 June 1987, *M.I.H. Brooker* 9686 & *S.D. Hopper* (holo: PERTH; iso: AD, CANB, MEL, NSW).

Low straggly *mallee* to 2.5 m tall with smooth coppery (in June) stems and non-glaucous branchlets. *Seedling leaves* petiolate, decussate, remaining opposite for 4-5 pairs, ovate, to 8 x 4 cm, dull, blue-green, later leaves alternating, broadly lanceolate, to 10 x 3 cm, slightly glossy, green. *Adult leaves* petiolate, alternating, lanceolate, to 11 x 1.5 cm, concolorous, glossy, green (drying yellowish green); intramarginal vein well in from leaf edge; reticulation sparse, with numerous large island oil glands. *Inflorescences* axillary and unbranched, or clustered at leafless ends of branchlets. *Peduncles* moderately stout, somewhat flattened, to 1.5 cm long, 7-flowered. *Buds* clavate, tapering at the base to stout pedicels, to 0.8 x 0.4 cm; operculum obtusely conical, red, hypanthium green. *Style* contracting at the base and inserted in a cavity of the ovary top, and thereby, more or less articulate. *Flowers* not seen. *Fruits* pedicellate, obconical, to 0.9 x 0.7 cm with 3, 4 or 5 valves.

*Other specimen examined*. WESTERN AUSTRALIA: Type locality, 11 Aug. 1984, *S.D. Hopper* 3887 (PERTH), 25 June 1987, *S.D. Hopper* 5888 (PERTH).

*Distribution*. Known only from the type locality where it occurs on red sand dunes with arkose rubble (Figure 1).

*Conservation status*. Vulnerable, occurring on vacant Crown Land. Declared as Rare Flora. (Species no. 152 in Hopper *et al.* (1990).

*Flowering period*. Unknown.

*Etymology*. From the Latin *articulatus* - articulate, referring to the loose attachment of the style base.

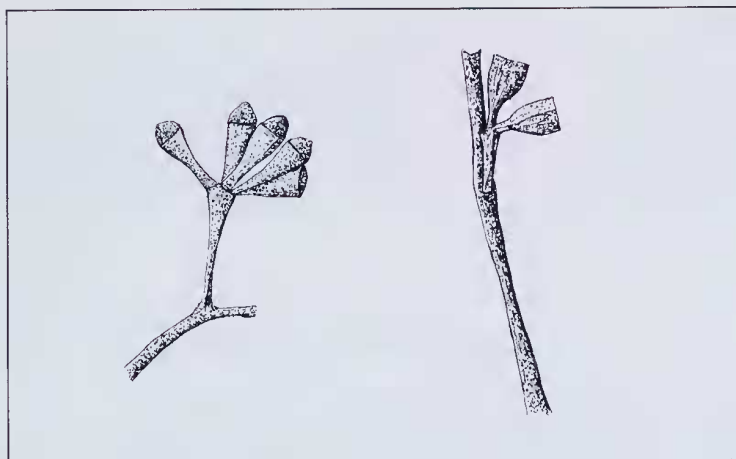


Figure 6. *E. articulata* - buds and fruit (MIHB 9686)

*Notes.* The *E.* series *Loxophlebae* is notable for the widespread taxon *E. loxophleba* subsp. *loxophleba*, (York Gum) which is distributed from west of Northampton to east of Ongerup. Its well known eastern, inland related taxon, the recently published *E. loxophleba* subsp. *lissophloia*, is a smooth-barked mallee which has glaucous branchlets, buds and fruits. Both taxa grow on heavy, often water-logged sites. However, the style in these taxa, although constricted at the base, is not inserted in a cavity. The style base character was given prominence by Carr & Carr (1985) for bloodwoods and has been seen in other species, viz. *E. leucoxylon* F. Muell. and *E. melliodora* A. Cunn. ex Schau. The other published taxon in the series is *E. loxophleba* subsp. *gratae* Brooker which has smooth bark and larger leaves, buds and fruit than the typical subspecies.

In a recent publication on Western Australian taxa, Hill & Johnson (1992) raised subsp. *gratae* to species, *E. gratae*. We prefer to maintain the subspecies status for the present, pending the studies of P. Grayling (University of Western Australia) who believes that the closest affinity of the taxon, *gratae*, is with *E. loxophleba* subsp. *lissophloia* and is of equal taxonomic status. A further revision is therefore expected of the *E.* ser. *Loxophlebae*, in which the intergradation, referred to by Hill & Johnson, of the closely related *gratae* and *lissophloia* will be demonstrated.

*E. blaxellii* is endemic to the Morseby Range and differs from York Gum in the low mallee habit, the smooth bark, intramarginal vein close to leaf edge, lack of tertiary veining, small buds and fruits, the upland lateritic stony habitat, and articulate style. In contrast to these species, *E. articulata* grows on red sand dunes with arkose rubble in much drier country than the others apart from the eastern glaucous mallee form of York Gum. It has much larger buds and fruit than *E. blaxellii* but shares the articulate style character.

#### **Eucalyptus ser. *Falcatae* Brooker & Hopper, ser. nov.**

Arbores "mallets" vel frutices "mallees". Cotyledones bisectae. Medulla ramulorum non glandulifera. Folia juvenilia petiolata, adulta petiolata, nitentia, venis secundariis numerosissimis et arte parallelis, reticulo finito et glandulis omnibus oleosis ad intersectiones. Inflorescentiae axillares, non ramosae, erectae vel decurvae et laxae vel rigide. Fructus latiores quam longiores orificio comparate parvo. Vestigia styli exilia saepe persistentia.



*Typus: E. falcata* Turcz.

Mallets or mallees. Cotyledons bisected. Pith of branchlets not glandular. Juvenile leaves petiolate and finally held vertically. Adult leaves petiolate, glossy, with very numerous parallel secondary veins, finite reticulation and numerous oil glands each of which appear at the veinlet intersections. Inflorescences axillary, unbranched, erect in one species, in remainder down-curved either loosely or rigidly. Ovary roof conical, lacking protuberances. Fruits wider than long with relatively small orifice. Style remnants slender, often persistent.

#### Key to subseries of *E. ser. Falcatae*

1. Buds pedicellate, inflorescences loosely or rigidly down-curved, rarely erect, hypanthium often wider than operculum; seedling leaves linear; juvenile leaves distinctly petiolate, early leaves opposite, later leaves alternating, held vertically; leaf bases truncate; trees, mallets or mallees ..... *E. subser. Falcatae*
1. Buds sessile or nearly so, inflorescences erect, buds often fusiform in stellate clusters; seedling leaves ovate; juvenile leaves shortly petiolate, opposite, held horizontally; leaf bases tapering to petiole; mallees ..... *E. subser. Decipientes*

#### Key to species of *E. subser. Falcatae*

1. Inflorescences rigidly down-curved ..... *E. kessellii*
1. Inflorescences pendulous, or erect in one species
  2. Mallet
    3. Buds and fruits strongly ribbed ..... *E. ornata*
    3. Buds and fruits smooth to slightly ribbed
      4. Fruit to 0.8 x 0.7 cm ..... *E. argyphea*
      4. Fruit to 0.9 x 1.2 cm ..... *E. recta*
  2. Mallee
    5. Buds and fruits always erect; mallee on coastal limestone ..... 9. *E. petrensis*
    5. Buds and fruits down-curved; mallee not on limestone
      6. Operculum conical
        7. Pedicels stout, buds and fruits slightly ribbed
          8. Pedicels >2 mm long ..... *E. goniantha* subsp. *goniantha*
          8. Pedicels <2 mm long ..... *E. goniantha* subsp. *notactites*
        7. Pedicels slender, buds and fruits smooth or ribbed. .... *E. falcata*
      6. Operculum rounded ..... *E. semiglobosa*

#### 9. *Eucalyptus petrensis* Brooker & Hopper, sp. nov. (Figure 7)

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 418 (1990).



Frutex "mallee" *Eucalypto falcatae* Turcz. affinis a qua habitatione petroso calcareo, habitu effuso, inflorescentiis semper non pendulis, pedicellis brevioribus, operculo brevioris rostrato, alabastris fructibusque vix costatis et fructibus aggregatis differt.

*Typus:* c. 1.5 km SSE of Seabird, 31°17'S, 115°26'E, 2 Nov. 1988, M.I.H. Brooker 10139 (holo: PERTH; iso: AD, CANB, MEL, NSW).

Straggly mallee to 4 m tall with smooth bark. Forming lignotubers. *Cotyledons* bisected. *Seedling leaves* sessile, opposite for about 4 pairs, linear, to 0.4 x 0.3 cm. *Juvenile leaves* at first shortly petiolate, opposite, then on petioles to 2 cm long, alternating, held vertically, ovate, to 9 x 6 cm, dull, blue-green to light green. *Adult leaves* petiolate, alternating, lanceolate to slightly falcate, to 12 x 2 cm, concolorous, slightly glossy, green; many side veins; reticulation dense, with numerous intersectional oil glands. *Inflorescences* axillary, unbranched, to 13-flowered; *peduncles* erect or scarcely curved, strongly flattened and angular, to 1.5 cm long. *Buds* pedicellate, hypanthium truncate-spherical or cupular and scarcely ribbed, operculum beaked, to 1.2 x 0.5 cm. *Stamens* inflexed, all fertile; anthers versatile, dorsifixed, cuboid, opening by longitudinal slits. *Flowers* not seen. *Ovules* in 4 vertical rows. *Fruits* pedicellate, truncate-spherical, aggregated, to 0.7 x 0.9 cm; rim thick; disc annular or sloping inwards; valves 3, slightly exserted. *Seed* grey-black, flattened-ovoid with a very shallow reticulum, hilum ventral.

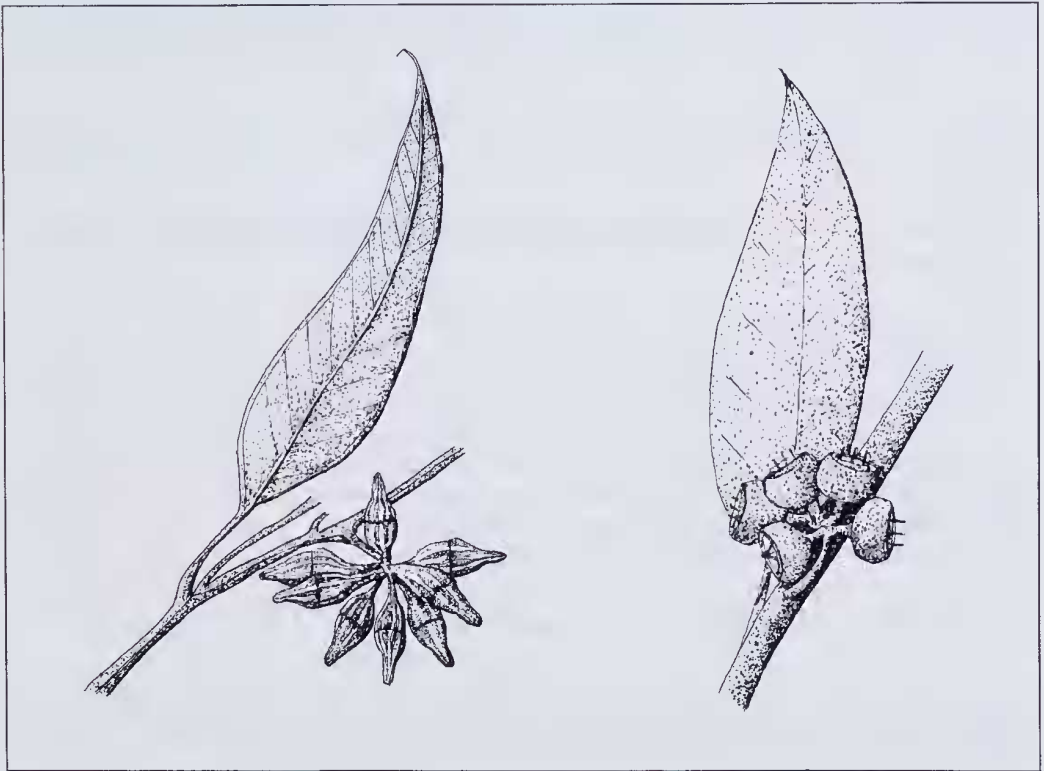


Figure 7. *E. petrensis* - buds and fruits (MIHB 9583)

Figure 7. *E. petrensis* – buds and fruits (MIHB 9583)

*Other specimens examined.* WESTERN AUSTRALIA: Fremantle, Aug. 1902, *C. Andrews s.n.* (PERTH); Wesco Rd, NE of Quinn's Rocks, 9 Apr. 1987, *M.I.H. Brooker* 9583 (CANB, PERTH); c. 16 km E of Yerramulla Road, 14 Aug. 1987, *M.I.H. Brooker* 9738 and *S.D. Hopper* (AD, CANB, MEL, NSW, PERTH); Seabird, along "Ambulance" Road, 31°16'S, 115°26'E, 13 Apr. 1988, *M.I.H. Brooker* 9930, 9931 (AD, CANB, MEL, NSW, PERTH); Type locality, 24 Jan. 1989, *M.I.H. Brooker* 10159 (AD, CANB, MEL, NSW, PERTH); c. 1.5 km SSE of Seabird, 24 Jan. 1989, *M.I.H. Brooker* 10160 (CANB, PERTH); Mindarie Keys, 31°41'10"S, 115°42'15"E, 2 July 1989, *A. Brown s.n.* (PERTH); c. 50 km S of Mandurah, near Preston Lodge, east side of lake, 10 Dec. 1989, *O.M. Green* SI and SII (PERTH); Ocean Farm, Lancelin, 10 June 1981, *R.J. Cranfield* 1689 (PERTH); Private Property, 4.4 km at 48° from Seabird and 4 km at 51° from Seabird, 5 Sep. 1980, *E.A. Griffin* 5701, 5702A (PERTH); c. 20 m S of Quinn's Rock Road, 500 m upslope from ocean, 15 Mar. 1987, *S.D. Hopper* 5853 (PERTH); NE of Quinn's Rock, 31°38'20"S, 115°45'30"E, 6 July 1988, *A. Kelly* 264 and *A. Napier* (PERTH); Yanchep Nat. Pk, 1.7 km N along W boundary from Yanchep Beach Road, 31°32'S, 115°40'E, 6 July 1988, *A. Kelly* 266, 267 and *A. Napier* (CANB, PERTH); c. 600 m S of Seabird, 31°17'10"S, 115°26'45"E, 11 Nov. 1988, *A. Kelly* 356 and *A. Napier* (PERTH); 600 m E of Burns Beach kiosk, 31°43'45"S, 115°43'35"E, 18 Aug. 1988, *A. Napier* & *A. Kelly* 297 (PERTH); 15 km SW of Wedge Island, 30°52'30"S, 115°20'30"E, 10 May 1989, *A. Napier* & *A. Kelly* 426 (PERTH); corner of Cowper and Raleigh Streets, Sorrento, 31°50'S, 115°45'E, 28 June 1989, *A. Napier* & *A. Kelly* 464 (PERTH); 8.3 km ESE of Two Rocks, off Bailey Road, W of Yanchep Nat. Pk, 31°30'40"S, 115°40'10"E, 26 May 1988, *R. McKay s.n.* (PERTH); Yalgurup Nat. Pk, 20 Oct. 1972, *S. Paust* 1348 (PERTH); Yanchep National Park, 12 July 1987, *N. McQuoid* YN16 no. 6 (PERTH); Lake Preston, 6 Dec. 1960, *Mr Ross* 3698 (PERTH).

*Distribution.* From Yalgurup National Park to Seabird on near-coastal limestone, Western Australia (Figure 1).

*Conservation status.* Uncommon and in need of further survey. Priority 3 in Hopper *et al.* (1990) - reserve flora list.

*Flowering period.* Not known.

*Etymology.* The name refers to the site where the type was collected (Latin *petrensis* - on a stony site).

*Notes.* *E. petrensis* has only been found on sites with outcropping limestone. It is similar to *E. falcata*, differing in its more effuse habit and much shorter pedicels and peduncles. It differs from *E. decipiens* in its smooth bark, smaller stature, and larger buds and fruits on longer pedicels. Rare hybrids with *E. decipiens* have been collected (*Brooker* 10161, 10162).

**Eucalyptus** subser. **Decipientes** Brooker & Hopper, subser. nov.

A subserie typica foliis juvenilibus horizontaliter dispositis, inflorescentiis saepe erectis, alabastris aggregatis plus minusve sessilibus, fusiformibus vel ovoideis, et fructibus aggregatis saepe compressis differt.

*Typus:* *E. decipiens* Endl.

Key to species of *E. subser. Decipientes*

- 1. Buds fusiform, operculum narrowly conical or slightly beaked;  
juvenile leaves emarginate
- 2. Bark rough
  - 3. Bark hard, tightly held over whole trunk or stems; tree  
or mallee ..... *E. decipiens* subsp. *decipiens*
  - 3. Bark loose, on whole or part of stems; mallee
    - 4. Bark ribbony; straggly mallee ..... 12a. *E. decipiens* subsp. *adesmophloia*
    - 4. Bark flaky, erect mallee ..... 12b. *E. decipiens* subsp. *chalaria*
- 2. Bark smooth; mallee ..... 10. *E. communalis*
- 1. Buds ovoid or diamond-shaped; juvenile leaves entire
  - 5. Buds ovoid
    - 6. Buds <0.4 cm wide; fruit crowded, sides often flattened ..... 11. *E. obesa*
    - 6. Buds >0.4 cm wide, acornlike ..... *E. balanites*
  - 5. Buds diamond-shaped, distinctly pedicellate ..... *E. phylacis*

10. *Eucalyptus communalis* Brooker & Hopper, sp. nov. (Figure 8)

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 418 (1990).

*Eucalypto decipienti* Endl. affinis aqua statura parviore, cortice laevi, et alabastris operculo rostrato differt.

*Typus:* 20 km SE of Hamersley River Bridge, 14.9 km S down Hamersley Drive (in Fitzgerald River National Park), 33°50'S, 119°43'E, *S.D. Hopper* 2413A (holo: PERTH).

*Mallee* to 4 m tall. *Bark* smooth. *Seedling leaves* sessile to very shortly petiolate (<0.2 cm long), opposite, orbicular. *Juvenile leaves* on short petioles to 0.5 cm long, opposite then alternating, held horizontally, obovate, emarginate, to 3 x 3 cm, dull, blue-green. *Adult leaves* petiolate, alternating, narrowly lanceolate to lanceolate, 6-9 x 1-1.5 cm, concolorous, glossy, green, intramarginal vein sometimes removed from edge, reticulation dense, with numerous intersectional oil glands. *Inflorescences* axillary, unbranched, > 7-flowered; peduncles 0.5-1.2 cm long. *Buds* sessile to very shortly pedicellate, fusiform to ovoid, to 1 x 0.4 cm; operculum conical to beaked. *Stamens* inflexed, all fertile; anthers, slightly versatile, basifixed, on abruptly narrowed filament tip, cuboid to reniform, opening by broad pores or oblique slits. *Flowers* creamy white. *Ovules* in 4 vertical rows. *Fruits* sessile or very shortly pedicellate, crowded, hemispherical, broader than long, to 0.7 x 0.9 cm; rim thick; disc broad, flat; valves 3 or 4, slightly exserted. *Seed* grey, compressed-ovoid, smooth, with some longitudinal furrows.

*Other specimens examined.* WESTERN AUSTRALIA: 14 miles W of Hamersley River Crossing, 7 Nov. 1969, *M.I.H. Brooker* 2320,2321 (PERTH); near Rabbit Proof Fence, c. 2 miles N of West Mount Barren, 5 Aug. 1970, *M.I.H. Brooker* 2735a (PERTH); 15.6 miles S of Fitzgerald Crossing towards Fitzgerald Reserve, 28 Aug. 1975, *M.I.H. Brooker* 4437 (CANB, PERTH); Cheadanup Reserve, 33°27'S, 120°37'E, 12 Nov. 1981, *M.I.H. Brooker* 7139 (CANB, NSW, PERTH); Fitzgerald National Park, 33°50'S, 119°50'E, 13 Nov. 1981, *M.I.H. Brooker* 7158 (CANB, NSW, PERTH); 6 km

SW along Savages Rd from E.L.D. road, 33°39'S, 122°20'E, 12 Aug. 1982, *M.I.H. Brooker* 7556 (CANB, NSW, PERTH); 4.5 km SW of Lanes Rd on Backmans Rd, NE of Esperance, 33°39'S, 122°14'E, 12 Aug. 1982, *M.I.H. Brooker* 7557 (CANB, NSW, PERTH); 15 km along Hamersley Drive, 33°47'S, 119°51'E, 25 Nov. 1987, *M.I.H. Brooker* 9817 (CANB, NSW, PERTH); Middle Rd, McDougal's eastern paddock to S of road, 10 Mar. 1988, *M.I.H. Brooker* 9925 (CANB, PERTH); 48 km NNW of Mt Melville, 34°33'30"S, 118°42'40"E, 31 Jan. 1988, *A. Napier & A. Taylor* 225 (PERTH).

*Distribution and habitat.* Very common on the eastern plains of the Fitzgerald National Park, extending north-east towards Cheadanup Reserve and eastwards to Esperance, Western Australia. Usually on lateritic white sands (Figure 1).

*Conservation status.* Common though sporadic, and well represented in conservation reserves such as Fitzgerald River National Park.

*Flowering period.* Unknown.

*Etymology.* From the Latin *communalis* - communal, alluding to its characteristic occurrence in clumps isolated by heath from similar neighbouring clumps.

*Notes.* *E. communalis* occurs characteristically in communities of many apparent individuals, together up to 15 m across and generally emergent above the surrounding vegetation. It is common along Hamersley Drive in Fitzgerald National Park. It is similar to *E. obesa*, differing in its fusiform buds and emarginate juvenile leaves. It may be confused with *E. decipiens* but differs in its smooth bark, more robust buds and fruits and its erect-stemmed habit with the canopy confined to the uppermost branches.

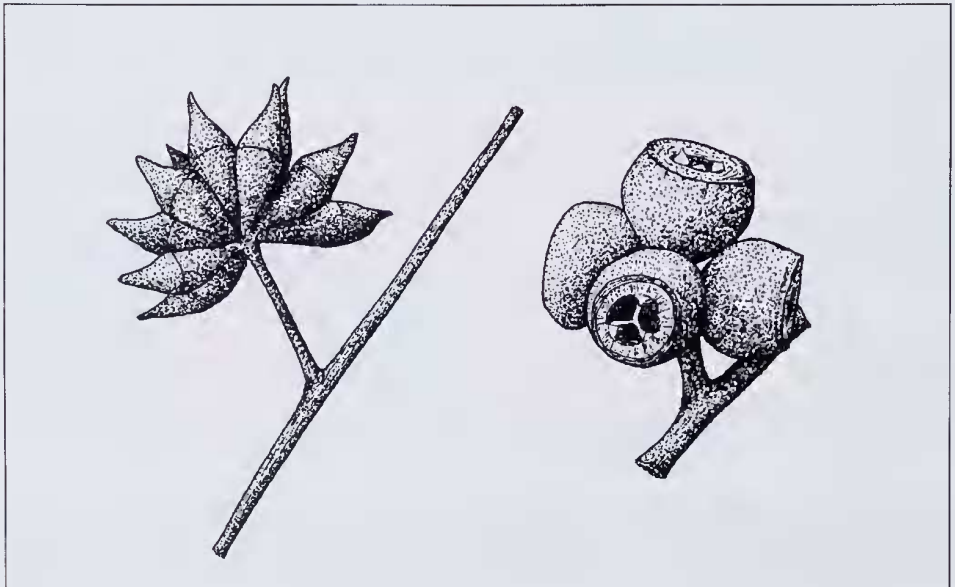


Figure 8. *E. communalis* - buds (SDH 2413A) and fruit (MIHB 9817) (x2)

**11. *Eucalyptus obesa* Brooker & Hopper, sp. nov. (Figure 9)**

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 418 (1990).

Frutex "mallee" *Eucalypto decipienti* Endl. affinis a qua habitu, cortice laevi, foliis parvioribus, floribus paucioribus et alabastris cylindricis vel interdum ovoideis differt.

*Typus*: 7.9 km W of Hill's Road on Tarin Rock Road, 33°04'S, 118°08'E, 16 Dec. 1987, M.I.H. Brooker 9832 (holo: PERTH; iso: AD, CANB, MEL, NSW).

*Mallee* to 2.5 m tall, effuse in habit with canopy to near ground, with smooth, grey bark or with loose ribbons of dead bark. *Seedling leaves* sessile to very shortly petiolate (<0.2 cm long), opposite, orbicular. *Juvenile leaves* on short petioles to 0.5 cm long, opposite then alternating, held horizontally, ovate to orbicular, to 3.5 x 3 cm, dull, blue-green to light green. *Adult leaves* petiolate, alternating, lanceolate, often uncinata, to 10 x 1.5 cm, concolorous, glossy, green; side veins very numerous; reticulation dense, with numerous intersectional oil glands. *Inflorescences* axillary, unbranched, to 11-flowered; peduncles terete, to 1 cm long. *Buds* sessile, crowded, cylindrical over most of their length, to 0.7 x 0.5 cm; operculum hemispherical, apiculate. *Stamens* inflexed, all fertile; anthers slightly versatile, basifixed on abruptly narrowed filament tip, cuboid to reniform, opening by broad pores or oblique slits. *Flowers* creamy white. *Ovules* in 4 vertical rows. *Fruits* sessile, crowded and often laterally compressed, truncately depressed-spherical, to 0.6 x 1 cm; rim thick; disc level, valves (3) 4, often slightly exerted. *Seed* grey, compressed-ovoid, very shallowly reticulate and with shallow longitudinal grooves.

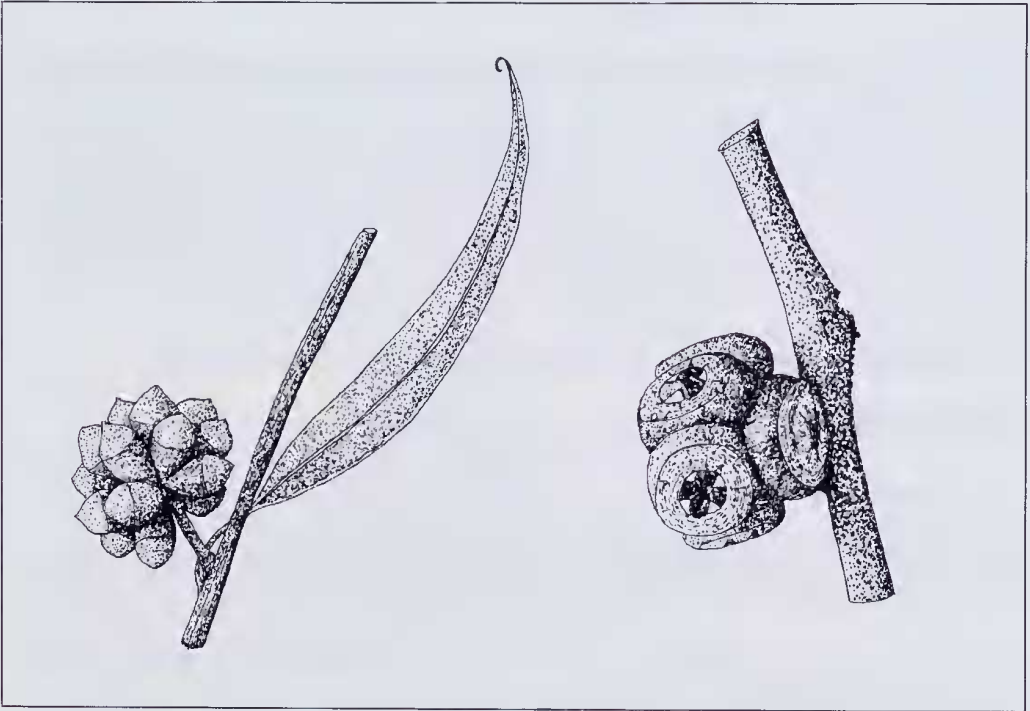


Figure 9. *E. obesa* - buds (MIHB 9810) and fruit (MIHB 9809) (x2)



*Other specimens examined.* WESTERN AUSTRALIA: 125 km E of Hyden, 3 Oct. 1975, *D.F. Blaxell* DFB/W75/40 & *M.I.H. Brooker* (CANB, K, NSW, PERTH); 90 mile tank, W of Norseman-Esperance Road, 16 Feb. 1970, *M.I.H. Brooker* 2516,2517 (PERTH); 125 km east of Hyden on Norseman track, 32°20'S, 119°03'E, 3 Oct. 1975, *M.I.H. Brooker* 4986 (CANB, NSW, PERTH); Peak Charles, 2 May 1982, *M.I.H. Brooker* 7506 (CANB, NSW, PERTH); 80 km SE of Wickiepin towards Lake Grace, 33°03'S, 118°09'E, 17 Dec. 1984, *M.I.H. Brooker* 8756 (AD, CANB, MEL, PERTH); Type locality, 24 Nov. 1987, *M.I.H. Brooker* 9809,9810 (AD, CANB, MEL, NSW, PERTH); 22.75 km SE of Muckinwobert Rock, 2.8 km NE of Rawlinson Road, 33°29'27"S, 120°36'03"E, 15 Aug. 1983, *M.A. Burgman* 2105 (PERTH); 24.5 km due ESE of Muckinwobert Rock, 11.1 km SW of Melaleuca Rd, 1 Oct. 1984, *M.A. Burgman* 4045 (PERTH); Peak Charles, 32°50'S, 121°25'E, 14 Jan. 1972, *H. Demarz* 3645 (PERTH); 32 km W of Lake Grace on Tarin Rock Road, 23 Oct. 1987, *J.W. Green* 5582 (PERTH); Ninety Mile Tank, 14 km SSW of Mt Classe, Bremer Range, 32°41'S, 120°41'E, 6 Sep. 1982, *S.D. Hopper* 2494 (PERTH), North Tarin Rock Reserve 29857, 23 km NW of Lake Grace, 13 Sep. 1975, *B.G. Muir* 410 (PERTH); 90 Mile Tank, Lake King-Norseman Rd, 21 July 1979, *K.R. Newbey* 5388 (PERTH); Peak Charles, c. 45 km W of Salmon Gums, 9 Nov. 1979, *K. Newbey* 6435 (PERTH), 2 km NW of 90 Mile Tank, Norseman-Lake King Road, 12 Nov. 1979, *K. Newbey* 6491 (PERTH).

*Distribution.* From north-west of Lake Grace eastwards to 90-mile Tank and Peak Charles, Western Australia (Figure 1).

*Conservation status.* Sporadic but common and represented in conservation reserves such as Frank Hann National Park.

*Flowering period.* December-January.

*Etymology.* The specific name alludes to the buds in comparison with the fusiform buds of *E. decipiens*, Latin *obesus* - fat.

*Notes.* *E. obesa* is clearly related to *E. decipiens* which is typically a rough-barked mallee or tree on coastal and subcoastal south-western plains and nearby hills. *E. obesa* is not a coastal species. Its furthest inland occurrence is around the 90-mile Tank north-east of Lake King. The inland distribution, stubby ovoid buds and tightly aggregated fruit distinguish it in the subspecies *Decipientes*. It grows on white sand with *E. falcata* Turcz. at the type locality.

**12a. *Eucalyptus decipiens* Endl. subsp. *adesmophloia* Brooker & Hopper, subsp. nov.**

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 418 (1990).

A subspecies typica cortice fibroso laxo pallidiore taeniaformi et habitu effusiore differt.

*Typus:* 8.2 km S along Carlawillup Road, 34°07'S, 119°03'E, 9 Mar. 1988, *M.I.H. Brooker* 9907 (holo: PERTH; iso: AD, CANB, MEL, NSW).

It differs from the typical subspecies in the more straggly habit and loose, paler, ribbony rough bark.

*Specimens examined.* WESTERN AUSTRALIA: Pallinup River, Jan. 1964, *G.E. Brockway s.n.* (PERTH); c. 30 km N of Albany on road to Borden, 16 Aug. 1979, *M.I.H. Brooker* 6364 (CANB, NSW,



PERTH); 8 km S of highway towards Gairdner, 14 Nov. 1981, *M.I.H. Brooker* 7161 (CANB, PERTH); 3 km NE of Sth Stirling School, 14 Nov. 1981, *M.I.H. Brooker* 7180 (CANB, NSW, PERTH); Chillinup Road, E of highway, 14 Nov. 1981, *M.I.H. Brooker* 7181 (CANB, NSW, PERTH); Gairdner River crossing near Qualup, 34°11'S, 119°19'E, 9 Mar. 1988, *M.I.H. Brooker* 9915 (CANB, PERTH); 12.3 km N of Bremer Bay-Borden Road on Jerramungup Road, 34°47'S, 118°47'E, 25 Nov. 1987, *M.I.H. Brooker* 9819 (CANB, PERTH); Bremer Bay, March 1958, *D.M. Churchill s.n.* (PERTH); Qualup, 28 Nov. 1960, *A.S. George* 1762, 1763 (PERTH); 1.7 km S of Warramurrup Hill, 34°26'S, 119°10'E, 9 Mar. 1988, *S.D. Hopper* 6337 (PERTH); Bremer Bay area, Aug. 1971, *A. Kessell* 962, 976 (PERTH); 1.7 km S of Warramurrup Hill, Aug. 1971, *A. Kessell* 976 (PERTH); junction of Swamp Road and Gordon Inlet Road, NW of Bremer Bay, 34°25'S, 119°25'E, 17 Nov. 1985, *A.N. Rodd* 5029 & *J. McCarthy* (CANB, NSW, PERTH); Fitzgerald River National Park, by Collett's road, c. 8 km WNW of West Mount Barren, 23 Oct. 1982, *A. Strid* 20977 (PERTH); 3 km W of Bremer Bay township, 1 Oct. 1966, *P.G. Wilson* 4323 (PERTH); c. 35 km SSE of Jerramungup-Ravensthorpe Road along No.2 Vermin Proof Fence, 2 Oct. 1966, *P.G. Wilson* 4370 (PERTH).

*Distribution.* From the southern and eastern part of the Stirling Range to Bremer Bay, Western Australia (Figure 1).

*Conservation status.* One of the most common eucalypts of the South Stirling sandplain. Well represented in conservation reserves.

*Flowering period.* Unknown.

*Etymology.* From the Greek *adesmos* - unfettered and *phloia* - bark.

*Notes.* *E. decipiens* subsp. *decipiens* which has a western coastal distribution is distinct from the new subspecies by its very tight, hard rough bark. Previously the name *E. decipiens* has been applied to a wide range of related mallees with various morphological distinctions from north of Perth to the Esperance district (Gardner 1952-1966, Chippendale 1973). Current research and field studies show there are the typical western coastal taxon (subsp. *decipiens*), the southern coastal and subcoastal taxon (subsp. *adesmophloia*), and the inland, intervening taxon (subsp. *chalara*), as treated below.

## 12b. *Eucalyptus decipiens* Endl. subsp. *chalara* Brooker & Hopper, subsp. nov.

A subspecies typica cortice laxiore pallidiore et a subspecies *adesmophloia* statura altiore et cortice squamata differt.

*Typus:* WESTERN AUSTRALIA. Stirling Range Caravan Park, near Bluff Knoll, 6 May 1979, *G.J. Keighery* 2292 (holo: PERTH; iso: CANB, NSW).

It differs from the typical subspecies in the more erect habit, looser, paler, rough bark decorticating in flakes, and preference for acidic sands; from subspecies *adesmophloia*, it differs in the taller, more erect habit, thinner stems, with the flaky rough bark over most of stems compared with the ribbony rough bark of the sinuous stems of the eastern subspecies.

*Specimens examined.* WESTERN AUSTRALIA: Stirling Range National Park, along the Cranbrook Rd, 26 Sep. 1975, *J.S. Beard* 7491 (PERTH); Mt Barker, 16 Oct. 1975, *J.S. Beard* 7700 (PERTH); c. 10 miles from Capel on the Donnybrook Rd, 18 Apr. 1972, *M.I.H. Brooker* 3573 (PERTH); Stirling

Range Caravan Park, Chester Pass Road, 5 May 1982, *M.I.H. Brooker* 7654 (CANB, PERTH); 9.6 km W of Yetermerup Road, N of Stirling Range, 19 July 1988, *M.I.H. Brooker* 9982 (CANB, PERTH); 3.6 km W of Bluff Knoll Lookout, 27 Mar. 1968, *G.M. Chippendale* 431 (CANB, PERTH); Cranbrook, 18 Feb. ?, *C.A. Gardner* 329 (PERTH); Sukey's Peak, Stirling Range near Cranbrook, 7 Mar. 1922, *C.A. Gardner* 808/1308 (PERTH); Toll's Pass, Stirling Range, 23 Apr. 1923, *C.A. Gardner* 1431/1931 (PERTH); Toll's Pass, Stirling Range, 23 Apr. 1923, *C.A. Gardner* 1434 (PERTH); Borden-Chester Pass, 30 Oct. 1953, *C.A. Gardner s.n.* (PERTH); Tambellup, 3 May 1964, *C.A. Gardner* 14702, 14706 (PERTH); N of Condinup (*sic*) (Wellington Location 5016, *fide* A.S.G.), NE of Boyup Brook, 19 Feb. 1969, *A.S. George* 9251 (PERTH); Mt Barker, Oct. 1900, *Colonel Goadby* B1250 (PERTH); 1 mile SW of Tenterden, 12 Mar. 1957, *J.W. Green* 1149 (PERTH); 1 mile E of Cranbrook, 12 Mar. 1957, *J.W. Green* 1151 (PERTH); 13.2 miles SE of Kojonup (0.6 miles S of Tambellup turnoff), 30 Sep. 1975, *J.W. Green* 4538 (PERTH); Granite Hill, road 40 km E of Mt Barker within 1 km of Kalgan River, 15 Mar. 1983, *J.W. Green* 4984 (PERTH); 500 m along Fisher Rd from intersection with Kojonup-Frankland Road, 21 Oct. 1985, *N. Hoyle* 1013 (PERTH); Mt Barker Hill, 3 km due SW of Mount Barker township, 22 Nov. 1985, *N. Hoyle* 1032 (PERTH); 2 miles S of Mount Barker-Manjimup Rd, W of Frankland River, 11 Apr. 1962, *E.A. Jenkins s.n.* (PERTH); 4 miles S of Mount Barker on C. Milton's property, 8 June 1973, *K.F. Kenneally* 1224 (PERTH); Slopes Red Gum Hill, Red Gum Springs, Stirling Ranges, 26 Feb. 1983, *G.J. Keighery* 5911 (PERTH); Gee Kabee Hill, W of Cranbrook, 8 Dec. 1987, *G.J. Keighery* 9800 (PERTH); Greenbushes, Oct. 1921, *M. Koch s.n.* (PERTH); Cranbrook, 18 Feb. 1918, *C.E. Lane-poole* 329 (PERTH); Stirling Range Headquarters, 27 Feb. 1975, *O.W. Loneragan* L239 (PERTH); Road N of Stirlings, 28 Feb. 1962, *K.R. Newbey* 149 (PERTH); W of Broomehill, 14 Jan. 1954, *R.D. Royce* 4806 (PERTH); 2.75 miles NNE of Boyanup, 5 Mar. 1954, *G.M. Storr s.n.* (PERTH).

*Distribution.* East of the Darling scarp, from about Boyup Brook to the Stirling Range (Figure 1).

*Conservation status.* Common and well represented in conservation reserves.

*Flowering period.* August-September.

*Etymology.* From the Greek *chalaros* - loose, slack, referring to the rough bark.

*Notes.* In the Stirling Range this subspecies occurs on the northern slopes and foothills, while subsp. *adesmophloia* occurs on the southern side of the range and further eastwards.

**Eucalyptus** ser. **Micrantherae** Benth., Fl. Austral. 3: 192, 217 (1867).

*Type:* *E. micranthera* F. Muell.

The *E. ser. Micrantherae* belongs in the informal subgenus *Symphyomyrtus*. The series is characterised by the following: tree or mallee, bisected cotyledons, pith of branchlets without oil glands, glossy adult leaves with very numerous parallel secondary veins and with dense, finite reticulation and numerous oil glands each of which appears at veinlet intersections, stamens inflexed, anthers reniform, opening by oblique slits, flowers creamy white, ovary roof 3-lobed with style base inserted, ovules in 4 vertical rows, fruits contracted at rim, rim thick; valves 3-partite by insertion of style base between halves of torn lobes either side.

We assign many of the species of *E. ser. Micrantherae* Benth. *sensu* Chippendale (1988) to the new series *Falcatae* while the remainder, *E. angustissima*, *E. halophila* and *E. cneorifolia*, do not belong to either series. *E. angustissima* and *E. cneorifolia* lack the grossly lobed ovary roof and the regularly pinnate secondary venation of the series *Micrantherae*, while *E. halophila* is isolated from all species in contention and has leaf architecture resembling the unrelated *E. annulata*.

#### Key to subseries of *E. ser. Micrantherae*

1. Bark smooth; adult leaves to 2.7 cm wide; fruit  $\pm$  sessile; subcoastal distribution, on white sand ..... *E. subser. Micrantherae*
1. Bark rough; adult leaves to 1.7 cm wide; fruit shortly pedicellate; inland distribution, on red sand ..... *E. subser. Bakerianae*

***Eucalyptus* subser. *Bakerianae*** (Chippendale) Brooker & Hopper, subser. nov.

*E. ser. Bakerianae* Chippendale, Fl. Australia 19: 496 (1988). *Type: E. bakeri* Maiden.

The *E. subser. Bakerianae* is included in the *E. series Micrantherae* because of various unifying characters (see above) and particularly by the recognition of the modified ovary roof. This structure appears nowhere else in the genus. The monotypic subser. *Micrantherae* occurs on white, subcoastal sandplains from west of Mt Maxwell in Fitzgerald National Park eastwards to Israelite Bay. The subser. *Bakerianae*, comprising *E. mannensis*, *E. jutsonii* and *E. bakeri*, occurs from near Shark Bay across the continent to south-eastern Queensland.

***Eucalyptus* ser. *Balladonienses*** Brooker & Hopper, ser. nov.

Arbores vel frutices. Cortex fibrosa. Cotyledones bisectae. Medulla non glandulifera. Folia viridia nitentia, reticulo finito et glandulis oleosis numeris conspicuis et pro parte maxima ad intersectiones. Inflorescentiae axillares, non ramosae. Opercula rostrata. Stamina inflexa. Flores citrini.

*Typus: E. balladoniensis* Brooker

Trees or mallees. Bark rough. Cotyledons bisected. Pith of branchlets not glandular. Leaves green, glossy, with finite reticulation and oil glands appearing mostly at intersections of veinlets, some "island". Inflorescences axillary, unbranched. Opercula beaked. Stamens inflexed. Flowers pale yellow.

#### Key to species of *E. ser. Balladonienses*

1. Bark rough, flaky; fruit to 1 x 1.3 cm; inflorescences often pendulous
  2. Pedicels > 6 mm long ..... *E. balladoniensis* subsp. *balladoniensis*
  2. Pedicels 0-2 mm long ..... *E. balladoniensis* subsp. *sedens*
1. Bark rough, hard; fruit to 0.8 x 0.9 cm; inflorescences erect ..... 13. *E. indurata*

### 13. *Eucalyptus indurata* Brooker & Hopper, sp. nov. (Figure 10)

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 214 (1990).

Arbor vel frutex "mallee" *Eucalyptum micrantheram* F. Muell. ex Benth. simulans a qua statura superiore, cortice indurato non-decorticato operculo rostrato, et floribus flavidis differt. Potens in terra erit semen eius.

*Typus:* 3.4 km N of Grigg's Road on Belgian Road, N of Dalyup, 33°23'S, 121°28'E, 6 June 1983, *M.I.H. Brooker* 8167, *L.A.S. Johnson* and *D.F. Blaxell* (holo: PERTH; iso: CANB, NSW).

Small tree or mallee to 10 m with hard, furrowed, grey-black rough bark over whole trunk or stems, smooth grey above. Forming lignotubers. Cotyledons bisected. Seedling leaves sessile, decussate, remaining opposite for more than 10 pairs, some slightly decurrent, ovate to deltoid, to 3 x 2 cm, blue-green, dull. Adult leaves alternating, petiolate, narrowly lanceolate to lanceolate, to 12 x 2 cm, concolorous, slightly glossy, green to greyish green; reticulation dense, with numerous mostly intersectional oil glands. Inflorescences axillary, simple, 7-flowered; peduncles slightly angular, to 1 cm long. Buds pedicellate, to 1.8 x 0.7 cm, bi-operculate; hypanthium cupular, inner operculum strongly beaked and longer than hypanthium. Stamens inflexed in bud, all fertile; anthers versatile, sub-basifixed, oblong, opening by longitudinal slits. Flowers pale yellow. Ovules in 4 vertical rows on placenta. Fruits pedicellate, hemispherical and slightly constricted at rim, to 0.8 x 0.9 cm; rim thick; disc annular; 4 slender style remnants often persisting and exserted. Seed grey, shiny, compressed-ovoid, almost smooth, with a few shallow longitudinal grooves.

*Other specimens examined.* WESTERN AUSTRALIA: Grasspatch, north side opposite Kent's Rd turnoff, 33°14'S, 121°11'E, 30 Dec. 1979, *M.I.H. Brooker* 6723 (CANB, PERTH); 28 km W of Balladonia, 28 Apr. 1982, *M.I.H. Brooker* 7482 (CANB, NSW, PERTH); 118.4 km S of Norseman, 29 Apr. 1982, *M.I.H. Brooker* 7489 (CANB, PERTH); 26 km N of Ravensthorpe-Esperance Road via Lauriana and Boydell's Roads, 2 May 1982, *M.I.H. Brooker* 7418 (CANB); 4 km along Mt Ney Road, NE of Kau Rock Road turnoff, 33°24'S, 121°24'E, 12 Aug. 1982, *M.I.H. Brooker* 7551 (CANB, PERTH) and 5 Sep. 1983, *M.I.H. Brooker* 8163 (CANB, PERTH); 2.7 km W of Grasspatch on Grasspatch Road, 33°13'S, 121°40'E, 9 Apr. 1983, *M.I.H. Brooker* 8073 (CANB, PERTH); 4 km along Mt Ney road, NE of Kau Rock Rd t/o, NE of Esperance, 33°24'S, 122°24'E, 5 June 1983, *M.I.H. Brooker* 8163 (CANB, PERTH); 3.4 km N of Grigg's Road on Belgian Road, N of Dalyup, 121°28'E, 6 June 1983, *M.I.H. Brooker* 8166, (CANB, PERTH); 24.5 km NW of Balladonia, 12 Mar. 1984, *M.I.H. Brooker* 8486 (CANB, PERTH); 9 km up track N of Edwards Road, S of Pyramid Lake, 33°13'S, 120°54'E, 17 Jan. 1985, *M.I.H. Brooker* 8801 (CANB, NSW, PERTH); 13.9 km E of Ravensthorpe on Esperance Road, 33°36'S, 120°08'E, 17 Jan. 1985, *M.I.H. Brooker* 8803 (CANB, NSW, PERTH); 8.6 km along road 11, west of Ravensthorpe-Hopetoun Road, 33°42'S, 120°05'E, 20 Feb. 1985, *M.I.H. Brooker* 8854 (AD, CANB, NSW, PERTH); 29.3 km NE of Mt Ridley t/o on Dempster Road, 33°04'S, 122°16'E, 9 Apr. 1985, *M.I.H. Brooker* 8924 (AD, CANB, MEL, PERTH); corner of Griffith's and Dalyup Roads, 33°28'S, 121°36'E, 7 Nov. 1986, *M.I.H. Brooker* 9520 (CANB, NSW, PERTH); 34 km NNE of Mt Heywood, *M.A. Burgman* 1419 and *S. McNee* (PERTH); 41.5 km NNE of Mt Ney, 33°03'36"S, 122°38'40"E, 22 June 1983, *M.A. Burgman* 1430 and *S. McNee* (PERTH); 7 km NW of Clyde Hill, 33°17'49"S, 122°55'42"E, 6 Aug. 1983, *M.A. Burgman* 1794 and *S. McNee* (CANB, PERTH); 12 km NNW of Clyde Hill, 33°17'49"S, 122°55'42"E, 6 Aug. 1983, *M.A. Burgman* 1800 and *S. McNee* (PERTH); 40 km NW of Clyde Hill, 33°03'S, 122°45'E, 7 Aug. 1983, *M.A. Burgman* 1835 and *S. McNee* (CANB, PERTH); 32 km N of Mt Ney, 33°05'56"S, 122°25'31"E, 8 Aug. 1983, *M.A. Burgman* 1844 and *S. McNee* (PERTH); 34.5 km SSE of Peak Eleanor, 0.1 km W of Ned's Corner Road and Rollands



Road, crossroads, 33°15'16"S, 121°06'30"E, *M.A. Burgman* 1915 and *S. McNee* (CANB); 34 km NNE of Mt Heywood, 16.08 km NW of Mt Ney Road or Clyde Rock Road, 33°02'30"S, 122°36'52"E, *M.A. Burgman* 3019 and *C. Layman* (PERTH); Salmon Gums, 25 Oct. 1988, *D. Collins s.n.* (PERTH); (Lort?) River, Dec. 1940, *C.A. Gardner s.n.* (PERTH); 20.2 km W of Balladonia Road House on highway, 32°15'S, 123°26'E. 19 Oct. 1983, *K. Hill* 217, *L.A.S. Johnson* and *D. Blaxell*; 16 km W of Grasspatch on Grasspatch Road, 33°14'S, 121°32'E. 22 Oct. 1983, *K. Hill* 300, *L.A.S. Johnson* and *D. Blaxell* (NSW, PERTH); Dundas Nature Reserve, 14 Dec. 1990, *G.J. Keighery* 12610 (PERTH); 42 km W of Grasspatch, 15 Nov. 1980, *K. Newbey* 8139 (PERTH); Grasspatch, 1973, *P. Richmond* R100 (PERTH).



Figure 10. *E. indurata* - buds (MIHB 8486) and fruit (MIIB 8924) (x1.7)

*Distribution.* From south-west of Ravensthorpe to Balladonia and particularly common inland from Esperance, Western Australia (Figure 1).

*Conservation status.* Common and well represented in conservation reserves.

*Flowering period.* June-September.

*Etymology.* The name refers to the hard rough bark (Latin *induratus* - hard).

*Notes.* Habitat preference has not been noted over much of the range, but in the centre of the distribution (the Esperance hinterland), the species invariably occurs on slight rises in otherwise plain country or between salt lakes. The species is not readily confused with any other.

**Eucalyptus ser. *Subulatae*** Blakely, "A Key to the Eucalypts" 64, 267 (1934).

*Type:* *E. oleosa* F. Muell. ex Miq.

The *E. series Subulatae* belongs in the informal *E. subgenus Symphyomyrtus*. It is diagnosed by: mallee, mallet or tree, bark smooth or rough, cotyledons bisected, pith of branchlets not glandular, anthers cuboid or globoid, fruits with persistent fragile style remnants surmounting valves, seed grey, shiny, compressed-ovoid, smooth with shallow longitudinal furrows on dorsal side.

The series consists of about 50 taxa (L.A.S. Johnson, unpublished) more than half of which are unpublished, so a key to the published remainder would merely be an academic exercise of little application as so many of the new taxa are frequently encountered in the field.

#### 14. **Eucalyptus aspersa** Brooker & Hopper, sp. nov. (Figure 12)

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 246 (1990).

Frutex "mallee" ad *Eucalyptum* seriem *Subulatas* Blakely pertinens ad 5 m altus, cortice testaceo vel pallido-cinereo laxo, foliis plantularum et juvenilibus decussatis, ellipticis, ad 3.5 x 1 cm, hebetibus, viridibus, foliis adultis viridis leviter nitidis, fructibus parvis (ad 0.7 x 0.6 cm), et opercula rostrata differt.

*Typus:* 2 km N of Serpentine River along Albany Highway, 32°31'S, 116°21'E, 9 Oct. 1985, M.I.H. Brooker 9047 (holo: PERTH; iso: CANB, NSW).

*Mallee* to 4 m tall with light yellowish brown to light grey rough bark loosely held on lower half of stems, or of long smooth strips partly detached. Forming *lignotubers*. *Seedling leaves* sessile, decussate, remaining opposite for 5-7 pairs, elliptical, to 3.5 x 1 cm, dull, green. *Adult leaves* alternating, petiolate, narrowly lanceolate to lanceolate, to 9 x 1.5 cm, concolorous, slightly glossy, green; reticulation dense, with very numerous intersectional oil glands. *Inflorescences* axillary, unbranched, to 13-flowered; peduncles slightly flattened, to 0.8 cm long. *Buds* pedicellate, to 1.2 x 0.3 cm, bi-operculate; hypanthium cupular, inner operculum beaked and much longer than hypanthium. *Stamens* mostly inflexed with anthers around style; all fertile. *Flowers* not seen. *Ovules* in 4 vertical rows on placenta. *Fruits* pedicellate, cupular to slightly urceolate, to 0.7 x 0.6 cm; 4 persistent style remnants may emerge. *Seed* flattened ovoid, grey-brown, almost smooth, with a few shallow longitudinal grooves, hilum ventral.

*Other specimens examined.* WESTERN AUSTRALIA: Summit of Mt Saddleback, 32°58'S, 116°27'E, 26 July 1983, M.I.H. Brooker 8249,8250 (CANB, NSW, PERTH), 20 Oct. 1983, M.I.H. Brooker 8291,8292 (CANB, NSW, PERTH); Metro Road, 1.6 km S of Pike's Road, 7.9 km N of Wearne Road, North Bannister, 32°30'S, 116°31'E, 9 Oct. 1985, M.I.H. Brooker 9043 (CANB, PERTH); 0.6 km S of Pike's Road, 32°29'S, 116°31'E, 9 Oct. 1985, M.I.H. Brooker 9044 (CANB, PERTH); 9.6 km E of Metro Road, 32°32'S, 116°36'E, 27 Nov. 1985, M.I.H. Brooker 9128 (CANB, NSW, PERTH); Rick's Road, E of N Bannister, 32°33'S, 116°40'E, 4 June 1986, M.I.H. Brooker 9341



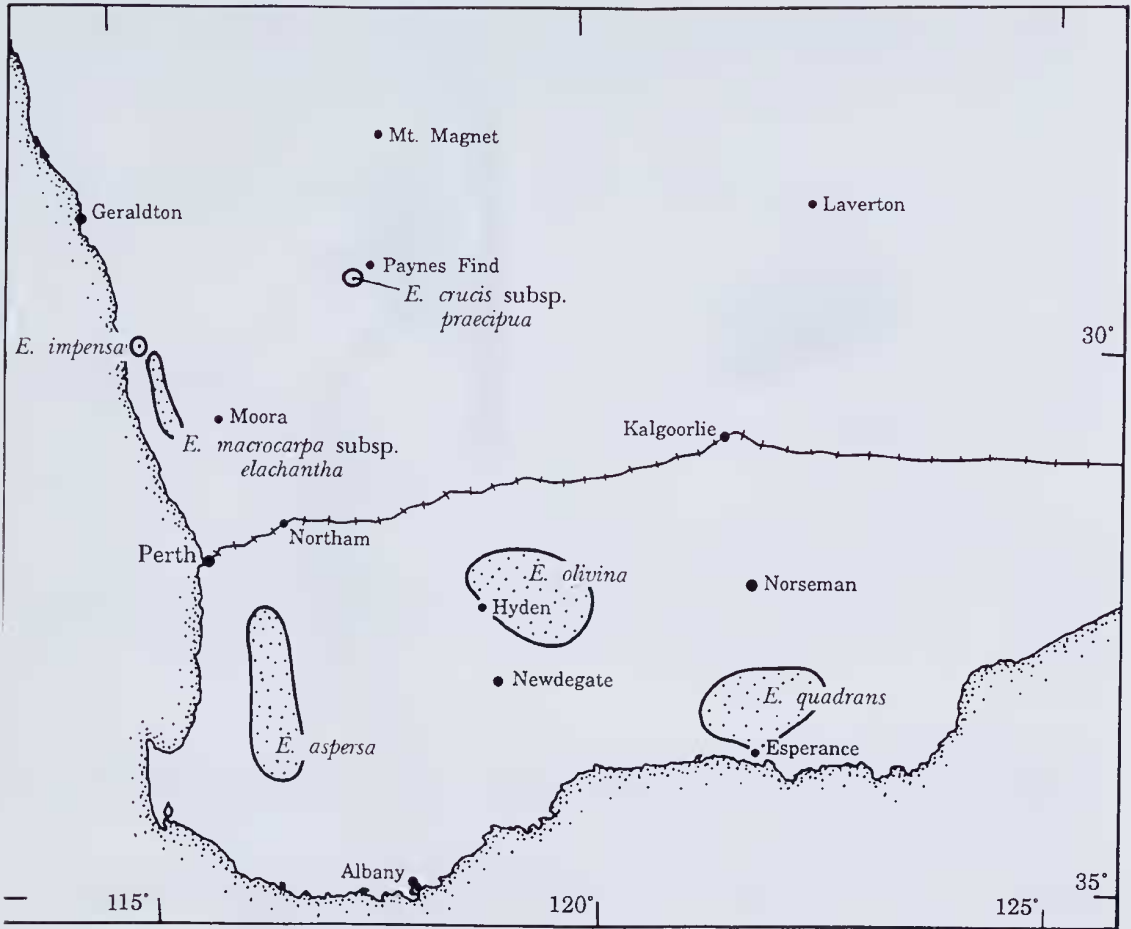


Figure 11. Distribution of taxa Nos 14, 16, 17, 19-21.

(CANB, NSW, PERTH); N of Crossman, E of Albany Highway, 31 Mar. 1987, *M.I.H. Brooker* 9578a (CANB, PERTH); Tohl's farm, SW of Kojonup, 33°54'S, 117°02'E, 26 Nov. 1987, *M.I.H. Brooker* 9827 (AD, CANB, MEL, NSW, PERTH); 2.1 km S on Metro Road, S of Brookton Highway, 13 June 1988, *M.I.H. Brooker* 9961, 9962 (AD, CANB, MEL, NSW, PERTH); Godfry Block, S of Williams, May 1973, *R. Edmiston* 363 (PERTH); 9 km N of Frankland townsite, *F. Haynes s.n.* (PERTH); Top of Mt Saddleback, 24 Oct. 1983, *K. Hill* 363, *L.A.S. Johnson & D. Blaxell* (NSW, PERTH); Boyup Brook area, July 1986, *E.M. Knapp s.n.* (PERTH); E of Boyup Brook Shire, Oct. 1986, *E. Knapp s.n.* (PERTH); Wahkinup Reserve, 28 Feb. 1989, *G.S. McCutcheon* 2001 (PERTH); Dobaderry Reserve, N of Brookton Hwy, 23 Feb. 1990, *S. Patrick* 460 (CANB, K, PERTH); Stockyard Block, Harvery (*sic*) district, 23°07'10"S, 116°24'12"E, 9 Aug. 1988, *J.L. Robson* 89 (PERTH); Wandering Forest Block, June 1989, *J.L. Robson* 368 (PERTH); Lane Poole Reserve, 29 June 1989, *J.L. Robson s.n.* (PERTH); 1.3 km S down South Rd from Wearne Rd Junction, Wearne Forest Block, 1990, *J.L. Robson s.n.* (PERTH); 2.1 km N up Link Rd, from junction of Wearne road and 150 m west, 28 Feb. 1990, *J.L. Robson s.n.* (PERTH); Mt Saddleback, 32°57'S, 116°27'E, 28 Aug. 1980, *A. Weston* 12614 (PERTH); Narrogin, 5 Nov. 1927, *C.J. White* 5299 (PERTH); Julimar State Forest, map ref. MX7754, 30 Aug. 1978, *C.W. (sic) s.n.* (PERTH).



Figure 12. *E. aspersa* - buds and fruit (x1.2) (MIHB 9128)

*Distribution.* From the vicinity of Boyup Brook and Kojonup northwards through the Darling Range to about the Brookton Highway west of Westdale, Western Australia (Figure 11).

*Flowering period.* Not known.

*Conservation status.* Widespread in the eastern jarrah forest but sporadic and locally rare. In need of monitoring (Priority 5 in Hopper *et al.* 1990).

*Etymology.* The name refers to the scattered occurrence of the populations in the jarrah forest (Latin *aspersus* - scattered).

*Notes.* *E. aspersa* occurs in small, more or less pure stands in open forest. There are many occurrences between North Bannister and Westdale on flat country between low hills. It occurs notably at one elevated site. This is a stand on the summit of Mt Saddleback south of Boddington. While forming fruits, this population has been found to be sterile unlike all other stands examined.

**Eucalyptus** ser. **Curviptera** Maiden, "Crit. Revis. Gen. *Eucalyptus*" 7:117 (1925).

*Type:* *E. burracoppinensis* Maiden & Blakely

The *E.* ser. *Curviptera* belongs in the informal *E.* subgenus *Symphyomyrtus*. The series is diagnosed by the following: mallee rarely tree, decorticated bark often ribbony and held loosely over most of

stems, rough in one species, cotyledons bisected, pith of branchlets not glandular, leaves moderately thick; buds and fruit relatively large and include the largest in the genus, buds few in number (two species with single buds, several with three, few with seven), ovules in 4-10 vertical rows, disc of fruit prominent and in some species massive, concave, ascending to vertical.

The series comprises two subseries, easily identified by the arrangement of the stamens.

**Key to subseries of *E. ser. Curviptera***

- 1. Stamens inflexed ..... *E. subser. Inflexae*
- 1. Stamens erect, oblique or variously curved ..... *E. subser. Curviptera*

***Eucalyptus* subser. *Inflexae* Brooker & Hopper, subser. nov.**

Arbor parva rare fruticosa, cortice laevi aurantiaco vel aurantiaco-brunneo vetere saepe laxe tenenti atroporphyreo. Folia adulta falcata, viridia, leviter nitentia. Inflorescentiae 7-florae. Alabastra ovoidea vel globosa. Stamina inflexa. Fructus haemispherici disco lato annulato, saepe rimis radiatis.

*Typus:* *E. lane-poolei* Maiden

*Notes.* *E. lane-poolei* occurs in small scattered communities from south-east of Busselton and near Denmark, northwards on the western scarp of the Darling Range and adjacent plains extending towards Jurien. In habit it is often a crooked tree. The bark is usually bright orange in season. The leaves are glossy, a rare feature in series *Curviptera*, and characteristically falcate. The inflexed staminal filaments and radially split surface of the disc distinguish it in the series.

***Eucalyptus* subser. *Curviptera***

**Key to species of *E. subser. Curviptera***

- 1. Inflorescences single-flowered
  - 2. Leaves on mature plant glaucous
    - 3. Inflorescences with long, down-curving peduncle ..... *E. rhodantha*
    - 3. Inflorescences without peduncles or peduncles very short
      - 4. Leaves on mature plant to 24 x 11 cm; fruit to 7 cm wide ..... *E. macrocarpa* subsp. *macrocarpa*
      - 4. Leaves on mature plant to 10 x 7 cm; fruit to 5 cm wide ..... 17. *E. macrocarpa* subsp. *elachantha*
  - 2. Leaves not glaucous, petiolate
    - 5. Leaves on mature plant pale green to yellow green on short, stout petioles to 1 cm long ..... 16. *E. impensa*
    - 5. Leaves (adult) blue-green to grey-green, petioles to 3 cm long ..... *E. rameliana*
- 1. Inflorescences >1-flowered

- 6. Leaves on mature plant shortly petiolate, opposite to sub-opposite, ovate, to 13 x 10 cm, dull, grey-green; inflorescences 3- or 7-flowered; flowers cream or pale pink ..... *E. carnabyi*
- 6. Without the above combination of characters
  - 7. Inflorescences 3-flowered
    - 8. Buds smooth ..... *E. oldfieldii*
    - 8. Buds ribbed
      - 9. Peduncles to 8 cm long; fruits to 5.5 cm wide ..... *E. pyriformis*
      - 9. Peduncles to 4 cm long
        - 10. Adult leaves maturing glossy green; inflorescences erect ..... *E. burracoppinensis*
        - 10. Adult leaves dull; inflorescences pendulous
          - 11. Buds to 5 x 5 cm ..... *E. youngiana*
          - 11. Buds to 4.5 x 3.5 cm
            - 12. Fruits to 3 x 4 cm, ribs sharp
              - 13. Flowers yellow; branchlets, buds, fruit not glaucous ..... *E. kingsmillii* subsp. *kingsmillii*
              - 13. Flowers pink to red; branchlets, buds fruit glaucous ..... 18. *E. kingsmillii* subsp. *alatissima*
            - 12. Fruits to 2 x 3.3 cm; ribs rounded ..... *E. pachyphylla*
  - 7. Inflorescences 7-flowered
    - 14. Bark rough ..... 15. *E. glomerosa*
    - 14. Bark smooth
      - 15. Buds ribbed, red ..... *E. sessilis*
      - 15. Buds smooth
        - 16. Operculum beaked ..... *E. oxymitra*
        - 16. Operculum conical
          - 17. Disc of fruit broad, ascending ..... *E. drummondii*
          - 17. Disc of fruit annular ..... *E. annuliformis*

**15. *Eucalyptus glomerosa* Brooker & Hopper, sp. nov. (Figure 13)**

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 262 (1990).

Misapplied name: "*E. ewartiana*" auct. div. non Maiden, e.g. Black in "Flora of South Australia" 632 (1952), Chippendale in "Flora of Central Australia" 243 (1981).

Frutex "mallee" ad 5 (raro 10) m alta, cortice inferiore laxa, squamata, brunnea vel flavo-brunnea, superiore laevi, grisea, vel vivide cuprina. Folia adulta alternantia, petiolata, elliptica vel lanceolata, ad 9 x 1.8 cm, hebetia pallido-viridia. Inflorescentiae axillares; alabastra globosa pedicellata, fructus pedicellati, globosi discum includens, ad 1 x 1.5 cm, disco elevato, valvis exsertis.

*Typus*: 180 km NE of Cosmo Newberry, 9 May 1984, *M.I.H. Brooker* 8538 & *S.D. Hopper* (holo: PERTH; iso: CANB, NSW).

*Mallee* to 5 m tall with flaky, loose, brown to yellow-brown rough bark for 1-3 m, smooth grey over salmon pink to bright coppery above; branchlets sometimes glaucous. Forming *lignotubers*. *Cotyledons* bisected. *Seedling leaves* petiolate, decussate, remaining opposite for 5-7 pairs, orbicular to ovate, to 4 x 4 cm, glaucous. *Adult leaves* petiolate, alternating, elliptical to lanceolate, to 9 x 1.8 cm, dull light green; side veins numerous; reticulation dense, with scattered intersectional oil glands. *Inflorescences* axillary, unbranched; 7(9)-flowered; peduncles terete, to 1.7 cm long. *Buds* on long pedicels to 1 cm long, globular, to 0.4 x 0.4 cm, bi-operculate; inner operculum hemispherical. *Stamens* oblique, all fertile. Mature anthers not seen. *Flowers* not seen. *Ovules* in 4 vertical rows. *Fruits* pedicellate, globose (including the disc), to 1 x 1.5 cm; rim thick; disc broad, ascending; valves (3)4(5), exserted to 0.4 cm. *Seed* yellow-brown, somewhat boat-shaped or asymmetrical with a wing-like extension at one end.

*Other specimens examined.* WESTERN AUSTRALIA: 0.9 km E of Warburton t/o on track to Neale Junction, 10 May 1984, M.I.H. Brooker 8550 & S.D. Hopper (AD, CANB, MEL, PERTH); 10 km E of Duketon on Bandya Stn, 27°38'S, 122°25'E, 7 June 1988, R.J. Cranfield 6886 (CANB, PERTH); 23 km S of Neale Junction, 28°28'S, 125°48'E, 16 July 1974, A.S. George 11955 (PERTH); 244 km SW of Warburton, 14 km SW of Terhan Rockhole on Laverton Road, 27°08'S, 121°41'E, 16 June 1983, S.D. Hopper 2915 (CANB, PERTH); 297 km SW of Warburton, 36.5 km NNE of Beegull Waterholes on Laverton Road, 27°25'S, 124°20'E, 16 June 1983, S.D. Hopper 2920 (PERTH); 16 km S of Neale Junction, 28°24'S, 125°47'E, 9 Jan. 1987, D.J. Pearson 146 (PERTH).

SOUTH AUSTRALIA: 2 km west of Vokes Hill Junction, 22 Aug. 1980, C.R. Alcock 8132 (AD); 72 km west of Vokes Corner, 4 June 1969, C.D. Boomsma 403 (AD); 25 km NE of Churina Well, 213 km N of Cook, 28°56'S, 130°26'E, 28 Aug. 1986, M.I.H. Brooker 9424 & D. Kleinig (AD, CANB, MEL, NSW, PERTH); 105.6 km E of Voke's Junction, 28°33'S, 131°41'E, 29 Aug. 1986, M.I.H. Brooker 9434 & D. Kleinig (AD, CANB, MEL, NSW, PERTH); south of Mt Lindsay, 5 July 1961, J.B. Cleland s.n. (AD); west of Serpentine Lakes, 20 July 1979, T. Dennis 20 (AD); 30 km west of Vokes Junction, 8 Feb. 1978, T. Dennis 98 (AD); 252 km north of Cook, 16 July 1977, T. Dennis 102 (AD); 30 km south on Kintore Avenue, 13 Aug. 1979, T. Dennis 176 (AD, CANB); south-east of Mt Cheeseman Peak Jn, c. 135 km south of Mann Range, 15 Aug. 1979, T. Dennis 178 (AD); west of Serpentine Lakes, 20 July 1979, T. Dennis 201 (AD); east of Serpentine Lakes, 19 July 1980, T. Dennis 208 (AD); c. 242 km west of Mabel Creek H.S., 16 July 1972, N. Donner 3888 (AD); c. 32 km west of Vokes Corner, 17 July 1972, N. Donner 3916 (AD); 2 km east of Vokes Corner, 22 Aug. 1980, N. Donner 7334 (AD, CANB); 80 km west of Vokes Corner, 27 Aug. 1980, N. Donner 7454 (AD, CANB); Victoria Desert, 18 Mar. 1969, B. Forbes s.n. (AD); 37 miles west of Emu, 8 Sep. 1956, N. Forde 507 (AD); north side of road running west from Vokes, 22 Aug. 1980, C. Jackson 1339 (AD); north of Lake Wyola, 1 June 1970, J. Johnson & S. Reid 5 (AD); station 24, western bank of Serpentine Lake, 27 June 1967, J. Johnson s.n. (AD); station 45, c. 7 km north of Lake Meramangye, 5 July 1967, J. Johnson s.n. (AD); 6.35 km north up lakes from Camp 1, 21 Jan. 1979, V.J. Levitzke 36 (AD, CANB); Serpentine Lakes, 22 July 1979, V. Levitzke 52 (AD); 15 miles north of Emu, 1 July 1967, T.R.N. Lothian s.n. (AD); c. 20 km west of Emu, 31 May 1967, T.R.N. Lothian 3910 (AD); 12 miles north-west of Emu, 31 May 1967, D. Scoles s.n. (AD); few miles north of Mt Lindsay, 6 Aug. 1962, D.E. Symon 2583, 2586 (AD); 47 miles south-east of Cheeseman's Peak Road, 6 Aug. 1962, D.E. Symon 2601 (AD); 8 km south of Waldana Well, 21 Aug. 1980, D.E. Symon 12382 (AD); 6 km west of Vokes Hill, 22 Aug. 1980, D.E. Symon 12419 (AD); ± 28 km west of Vokes Hill, 23 Aug. 1980, D.E. Symon 12493 (AD); c. 110 km north of Emu-Giles Road, 20 July 1961, H. Turner (AD); c. 10.5 km north-east of Moolapinna Hill, c. 4.5 km east-south-east of Ampeinna Hills, 26 Aug. 1978, D. Whibley 6381 (AD, CANB); 16 miles south of Mt Davies airstrip on road to Mt Lindsay, 5 Aug. 1962, P.G. Wilson 2472 (AD).



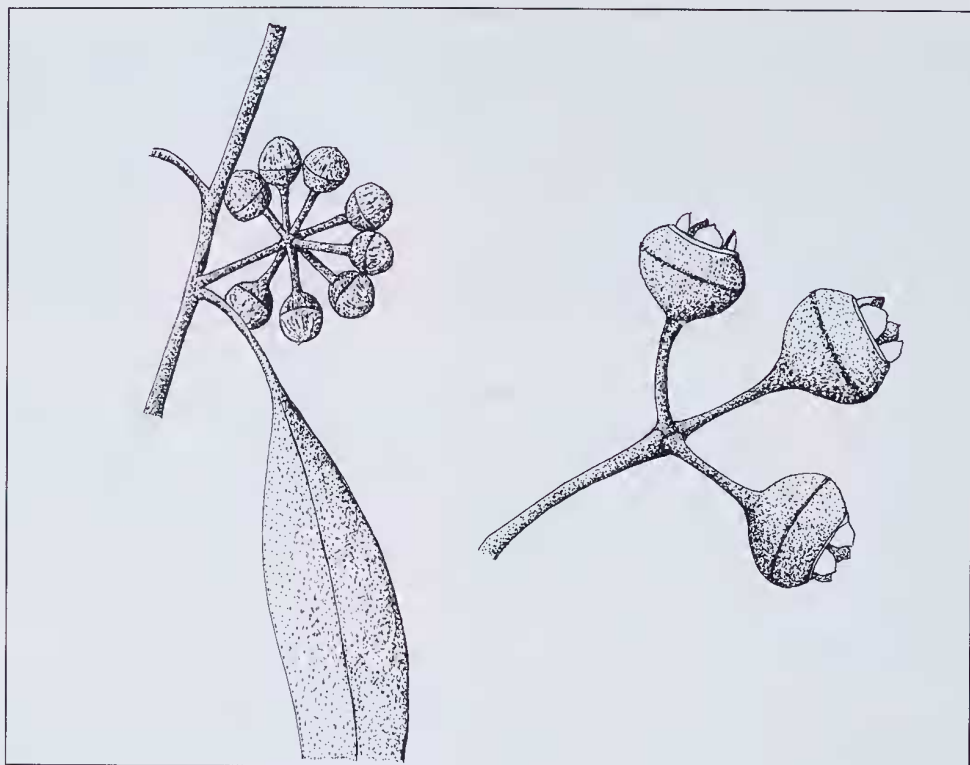


Figure 13. *E. glomerosa* - buds (MIHB 8550) and fruit (MIHB 9434)

*Distribution.* The Great Victoria Desert in both Western and South Australia, from south-west of Warburton east to south of Mt Davies and south-east to Emu, always north of the Nullarbor Plain, apparently restricted to red sand. This area is largely unexplored botanically and nothing is known of the continuity of occurrence of this new species (Figure 14).

*Conservation status.* Widespread and represented in desert conservation reserves.

*Flowering period.* Not known.

*Etymology.* The name refers to the globular buds (Latin *glomerosus* - globular).

*Notes.* *E. glomerosa* has been mistaken for *E. ewartiana* for many years (e.g. Chippendale 1973, 1988). This has probably been due to the similarity of the buds and fruit as seen on herbarium specimens. The fruits of *E. glomerosa* are similar in shape though larger but the bark of the two species is quite different. *E. ewartiana* has the distinctive minniritchi bark while that of *E. glomerosa* is more formless, being thick, loose and flaky. The pedicel of the fruit of *E. ewartiana* is stout, quadrangular in cross-section and widens towards the attachment with the hypanthium. In *E. glomerosa*, the pedicel is more slender, terete, and attaches to the  $\pm$  flat underside of the hypanthium.

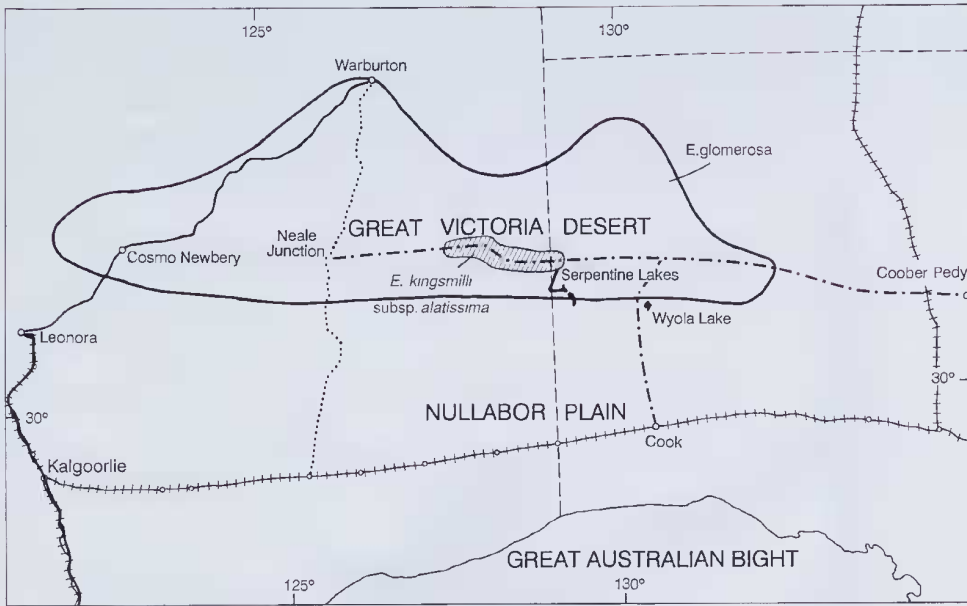


Figure 14. Distribution of *E. glomerosa* and *E. kingsmillii* subsp. *alatissima*

# 16. *Eucalyptus impensa* Brooker & Hopper, sp. nov. (Figure 15)

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 419 (1990).

Frutex "mallee" ad 1.5 m altus, effusus, cortice laevi cinereo vel pallido-cupreo. Surculi virides non glauci. Folia plantae maturae breviter petiolata, opposita vel sub opposita, ovata, ad 14 x 8 cm, hebetia, pallido-viridia vel flavido-viridia, rigida. Inflorescentiae axillares, flore solitario. Alabastra valde rostrata. Fructus sessiles hemisphaerici disco excluso, ad 2.5 x 6 cm, pedunculo crasso ad 2 cm longo, disco conspicuo ascendenti et valvis (5) exsertae. Semina pyramidalia, inaequilatera, brunnea, ventraliter costatis.

*Typus*: NW of Warradarge, 30°00'S, 115°15'E, 13 Aug. 1987, *M.I.H. Brooker* 9736 (holo: PERTH; iso: AD, CANB, MEL, NSW).

Straggly mallee to 1.5 m tall with grey over pale coppery smooth stems. *Juvenile leaves* petiolate, opposite for many pairs, ovate, to 11 x 6 cm, blue-green to glaucous. Shoots of new growth green, not glaucous. *Leaves* on mature plant on short stout petioles, opposite to sub-opposite, ovate, to 14 x 8 cm, concolorous, pale green to yellow-green, stiff. *Inflorescences* axillary with a single flower on a thick peduncle to 2 cm long. *Bud* on stout pedicel, hypathium hemispherical, operculum strongly beaked, slightly ribbed, to 5 x 2.5 cm including pedicel. *Stamens* all fertile; anthers versatile, dorsifixed, oblong, opening by broad lateral slits. *Flowers* pink. *Fruits* sessile, on thick pedicels to 2 cm long, hemispherical (not including the disc), to 2.5 x 6 cm; disc conspicuous, ascending; valves 5, exserted. *Seed* brown, pyramidal though asymmetrical, with ribs ascending to the ventral hilum.

*Other specimens examined.* WESTERN AUSTRALIA: Type locality, 7 Aug. 1988, *M.I.H. Brooker s.n.* (fruit and seed collection only, in CANB); and 13 Nov. 1991, *M.I.H. Brooker* 10865 (coppice, regrowth after fire) (CANB); 17 km NW of Moora, 3.4 km N along Agaton Rd from Moora-Badgingarra Rd, 30°03'30"S, 115°05'60"E, 30 July 1980, *S.D. Hopper* 1645 (PERTH); type locality, 29 May 1991, *A. Popplewell s.n.* (CANB) and 2 July 1991, *A. Popplewell s.n.* (CANB).

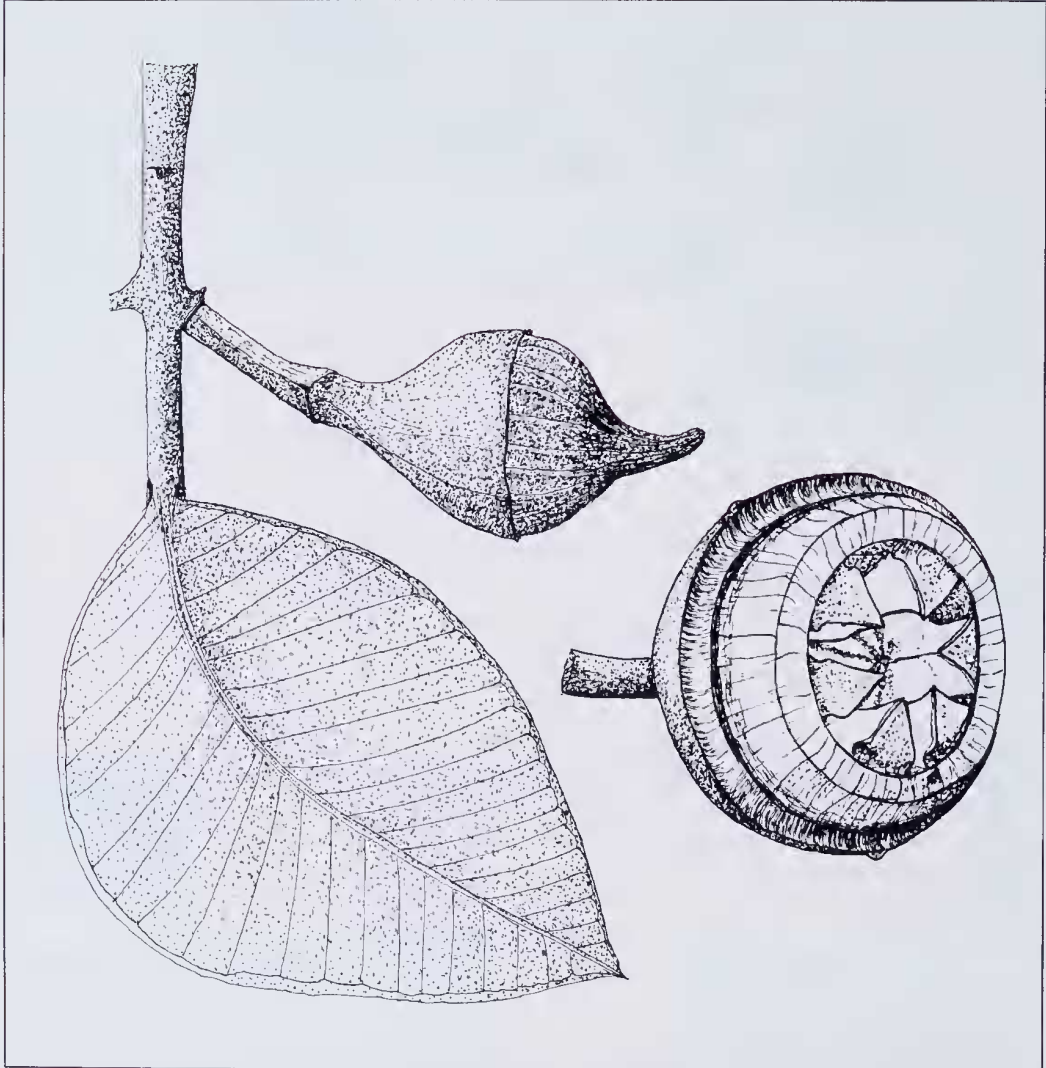


Figure 15. *E. impensa* - bud (*Popplewell s.n.*) and fruit (*MIHB* 9736) (x1.1)

*Distribution.* Known only from the type locality (Figure 11) and another near Moora.

*Conservation status.* Endangered. Declared as Rare Flora (species no. 151 in *Hopper et al.* (1990)).

*Flowering period.* June-July. The type population was not seen between Aug. 1988 and Sep. 1990 during which time the plants flowered and produced fruit and seed. It was first seen in flower on 2 July 1991 (*Popplewell s.n.* in CANB).

*Etymology.* From the Latin *impensus* - large, strong alluding to the leaves and fruit.

*Notes.* *E. impensa* at the type locality consists of about 10 plants on a sandplain south-west of Eneabba. The large fruit are reminiscent of *E. macrocarpa* but the shortly petiolate, non-glaucous leaves, both juvenile and adult, are distinctive. It occurs in association with *E. tetragona* (R. Br.) F. Muell. and *E. macrocarpa* Hook. subsp. *macrocarpa*, both of which exceed the depauperate *E. impensa* in stature. Following a fire that destroyed the above-ground specimens, the mallees are regenerating from the lignotubers and producing coppice of light green, petiolate leaves.

**17. *Eucalyptus macrocarpa* Hook. subsp. *elachantha* Brooker & Hopper, subsp. nov.**

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 266 (1990).

A subspecies typica foliis alabastris fructibusque brevioribus differt.

*Typus:* Cnr. Yandan Road and Brand Highway, 30°46'S, 115°34'E, 23 Jan. 1984, *M.I.H. Brooker* 8402 & *S.D. Hopper* (holo: PERTH; iso: CANB, NSW).

It differs from the typical subspecies in the smaller leaves (to 10 x 7 cm), buds (to 5.5 x 3 cm) and fruits (to 3 x 5 cm).

*Other specimens examined.* WESTERN AUSTRALIA: 48 miles NNW of Gin Gin, 2 Sep. 1970, *T.E.H. Aplin* & *R. Coveny* 3120 (CANB, PERTH); Mimegarra Road T/O on highway I, 2.2 km S of Ampol Roadhouse at Cataby, 18 Oct. 1978, *J. Briggs* 300 (CANB); 4 miles SW of Mount Lesueur, 23 July 1969, *M.I.H. Brooker* 1927 (PERTH); Yandanooka West Road, N/S section W of Mt Adams, 4 Feb. 1985, *M.I.H. Brooker* 8820 (CANB, PERTH); North West Road, SE of Badgingarra, 10 June 1986, *M.I.H. Brooker* 9348 (CANB, PERTH); NW of Warradarge on NS track, 4.3 km W of Brand Highway, 7 Aug. 1988, *M.I.H. Brooker* 10295 (CANB, PERTH); 2.6 km S of Gillingarra Road on Capitella Road, S of Dandaragan, 18 Aug. 1988, *M.I.H. Brooker* 10034 (CANB, PERTH); c. 7 miles NNE of Badgingarra, 18 Oct. 1966, *G.M. Chippendale* 25 (CANB, PERTH); 12 km N of Green Head Road along Eneabba South Road, 24 Jan. 1979, *M.D. Crisp* 5440 (CBG, PERTH); upper reaches of Hill River, 24 Aug. 1948, *C.A. Gardner* 9038 (PERTH); 30 km E of Eneabba, Aug. 1982, *N.J. Davidson s.n.* (PERTH); Allied Eneabba Sand Mine, 18 June 1979, *B. Dixon* S4495 (PERTH); New Geraldton Road, 7 miles N of the Watheroo-Jurien Bay crossroad, 2 Sep. 1966, *R. Filson* 8480 (PERTH); 6.6 km E of Badgingarra, 18 May 1967, *E. Holms s.n.* (CANB); 5 km S of Cataby Roadhouse on Brand Highway, 13 Nov. 1979, *S.D. Hopper* 1492 (PERTH); 22 km SSW of Eneabba, 13 Nov. 1979, *S.D. Hopper* 1499 (PERTH); 5.5 km SW of Mount Adams, 15 Nov. 1979, *S.D. Hopper* 1539 (PERTH); 43 km NW of Mingenew, 9 Sep. 1980, *S.D. Hopper* 1673 (PERTH); 30 km SSW of Mingenew, 10 Sep. 1980, *S.D. Hopper* 1673 (PERTH); 34 km ENE of Eneabba, 10 Sep. 1980, *S.D. Hopper* 1679 (PERTH); 16 km SW of Dandaragan, 5 km SE of Cataby, 11 Aug. 1983, *S.D. Hopper* 3121 (CANB, PERTH); 3 km S of junction of Mimegarra Road and Brand Highway, 5 June 1984, *S.D. Hopper* 3765 (PERTH); intersection of Mimegarra Road and Brand Highway, 5 June 1984, *S.D. Hopper* 3774 (PERTH); 0.8 km SSW of Yandanooka Hill, 3.5 km W on Lovegrove Road from Sundalara Road, 23 Nov. 1989, *A. Kelly* & *A. Napier* 551 (PERTH); along Brand Highway between Badgingarra and Gin Gin, c. 3 km SE of Cataby, 5 Dec. 1982, *A. Strid* 21710 (PERTH).

*Distribution.* From south of Cataby north almost to Badgingarra, Western Australia (Figure 11).

*Conservation status.* Uncommon but represented in conservation reserves and in need of monitoring. Priority 3 in Hopper *et al.* (1990) - reserve flora list.

*Flowering period.* August-September.

*Etymology.* The name refers to the smaller leaves, buds and fruit (Greek *elachys* - small and *anthos* - flower) compared with the typical subspecies.

*Notes.* This subspecies became evident after a study of *E. macrocarpa sens. lat.* by Hopper *et al.* (unpublished). It occurs towards the north-west of the distribution for *E. macrocarpa* and occurs within the overall distribution while not being actually sympatric.

**18. *Eucalyptus kingsmillii* subsp. *alatissima*** Brooker & Hopper, subsp. nov. (Figure 16).

A subspecies typica ramulis alabastris fructibusque plus valde alatis differt.

*Typus:* Halfway between Neale Jctn and Serpentine Lakes, Great Victoria Desert (28°20'S, 127°00'E), Western Australia, 18 Apr. 1991, *D. Nicolle* 7 (holo: CANB; iso: PERTH).

*Mallee* to 8 m tall with dark grey rough bark on stems to c. 10 cm diam. *Stems* and *branches* smooth grey over cream. *Branchlets* glaucous. Crown with predominance of short, ovate intermediate leaves. *Adult leaves* petiolate, alternating, ovate to lanceolate, 6-10 x 1.5-2 cm, concolorous, dull, blue-green to grey-green. *Inflorescences* axillary, unbranched, 3-flowered; *peduncles* down-turned, 1.5-5 cm long. *Buds* on angular pedicels to 2 cm long, glaucous, hypanthium obpyramidal, operculum pyramidal tapering to long straight or curved point, both with wide longitudinal wings (to 0.5 cm), to 3.5 x 2 cm; *stamens* oblique, all fertile; anthers versatile, sub-basifixed, with prominent terminal gland, opening by broad lateral slits; *flowers* pink to red. *Fruits* winged, to 1.5 x 2.5 cm; disc broad, ascending; valves 4, exserted.

*Other specimens examined.* WESTERN AUSTRALIA: Eastern Division. Victoria Desert, July 1972, *G. Brooks s.n.* (AD, CANB); Eastern Division. c. 92 km W of Serpentine Lakes, 18 July 1972, *N.N. Donner* 3950 (AD, CANB); N of Nullarbor, 1969, *J. Forde* (PERTH); Great Victoria Desert, Connie Sue Highway, 27 Aug. 1980, *D.E. Symon* 12753 (ADW, CANB).

SOUTH AUSTRALIA: Region 1: North-western (28°31½'S, 129°57'E), 25 July 1979, *J. Douglas* 66 (AD, CANB); 75 km west of Vokes Corner, track to Serpentine Lakes (28°32'S, 129°58'E), 24 Aug. 1980, *J.S. Weber* 6443 (AD, CANB).

*Distribution.* Known only along the track in the Great Victoria Desert east of Neale Junction in Western Australia towards Vokes Junction north of Cook in South Australia. The northerly and southerly distributions are not known (Figure 14).

*Conservation status.* Common and well represented in desert conservation reserves.

*Flowering period.* April-May.

*Etymology.* The name refers to the very prominent wings on the buds and fruit compared with those of the typical subspecies (Latin *alatus* - winged, in the superlative).



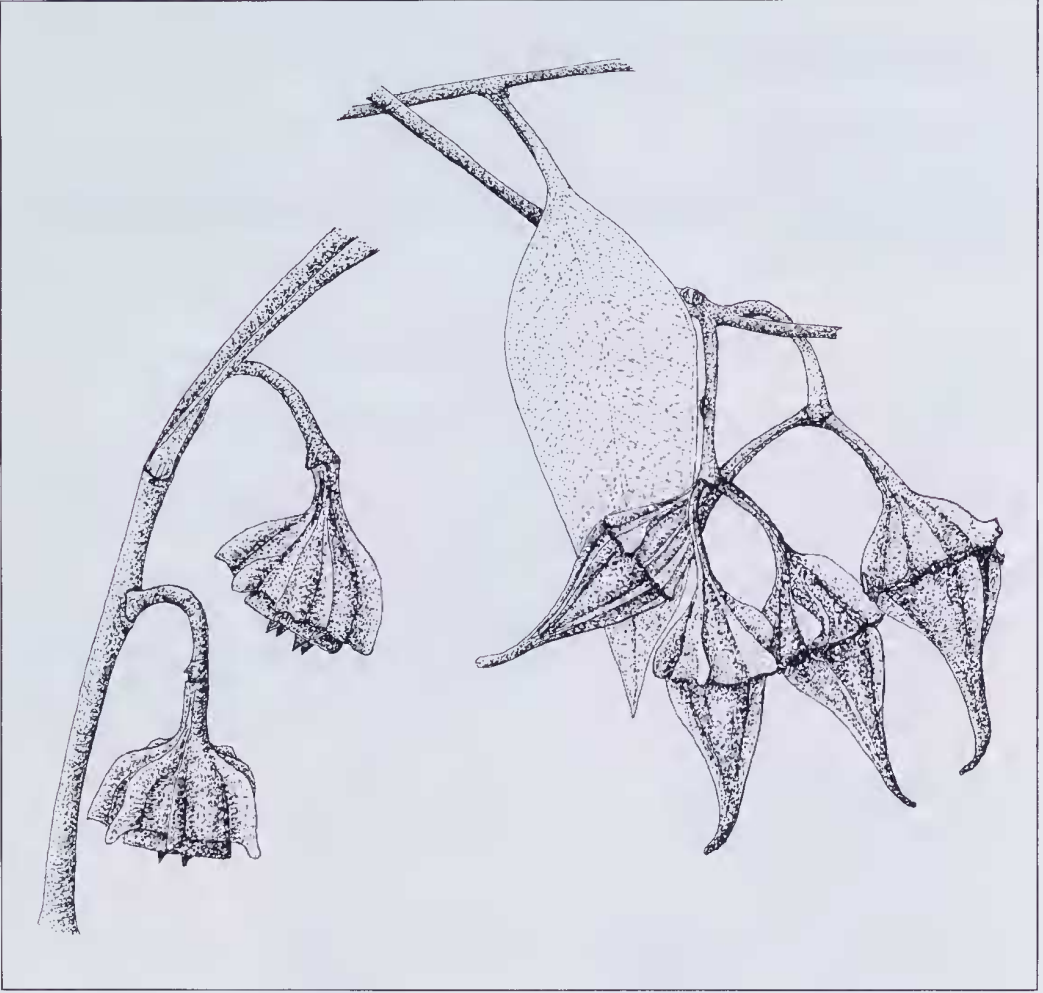


Figure 16. *E. kingsmillii* subsp. *alatissima* - fruit and buds (Nicolle 7).

*Notes.* *E. kingsmillii* subsp. *alatissima* differs from the typical subspecies and from *E. pachyphylla* in the glaucous branchlets, the long attenuate opercula, and the deep wings of the buds and fruit. From *E. kingsmillii* subsp. *kingsmillii* it differs in the red or pink flowers. Pink or red flowers occur (rarely) in some *E. pachyphylla* but the buds and fruits are usually smaller than those of *E. kingsmillii* subsp. *alatissima* and the peduncles much shorter.

All three taxa grow in relatively remote areas. *E. kingsmillii* subsp. *kingsmillii* and *E. pachyphylla* appear to overlap in distribution and morphology, and while the distribution for *E. kingsmillii* subsp. *alatissima* is the least known, it is possible that it occurs to the south and east and in isolation of these other two. With its brilliantly coloured flowers and the grossly sculptured buds and fruit, *E. kingsmillii* subsp. *alatissima* has considerable horticultural merit.

**Eucalyptus ser. Orbifoliae** Brooker & Hopper, ser. nov.

Arbores parvae vel frutices "mallees" cortice characteristica Minni Ritchi inflorescentiis 7-floribus, operculo exteriori vero, et disco fructus ascendenti.

*Typus:* *E. orbifolia* F. Muell.

Small trees or mallees with minniritchi bark, 7-flowered inflorescences, a true outer operculum, and ascending disc to the fruit.

**Key to species and subspecies of the *E. ser. Orbifoliae***

1. Operculum shorter than or equal to hypanthium, rounded or pileate with buds constricted, pedicels stout and often angular; leaves of the seedling petiolate, dull green ..... *E. ewartiana*
1. Operculum longer than hypanthium, pointed, buds not constricted, pedicels not strongly angular; leaves of the seedling petiolate or sessile, glaucous
  2. Leaves of mature plant lanceolate or narrowly lanceolate, petiolate, entire
    3. Leaves to 15 x 2.5 cm, buds to 1.5 x 1 cm, fruits to 1.3 x 2 cm; basal bark thick amorphous, minniritchii above ..... 19. *E. crucis* subsp. *praecipua*
    3. Leaves to 8 x 1.5 cm, buds to 0.7 x 0.5 cm, fruits to 0.8 x 1.4 cm; minniritchi bark from base up ..... *E. crucis* subsp. *lanceolata*
  2. Leaves of mature plant orbicular or elliptical or ovate, sessile or petiolate, entire or emarginate
    4. Leaves of mature plant glaucous, sessile and orbicular or broader than long, or shortly petiolate and ovate, entire; seedling leaves sessile; tree or mallee ..... *E. crucis* subsp. *crucis*
    4. Leaves of mature plant green or glaucous, petioles to 2 cm long, elliptical or ovate to orbicular, emarginate; seedling leaves petiolate; usually a mallee
    5. Leaves ovate or orbicular, glaucous
      6. Operculum rounded ..... *E. orbifolia* subsp. *orbifolia*
      6. Operculum conical
        7. Operculum more than 3 times longer than hypanthium ..... *E. educta*
        7. Operculum less than 2.5 x longer than hypanthium ..... *E. lata*
  5. Leaves longer than broad, green or yellow-green ..... *E. orbifolia* subsp. *websteriana*

**19. *Eucalyptus crucis* Maiden subsp. *praecipua* Brooker & Hopper, subsp. nov. (Figure 17)**

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 419 (1990).

A *Eucalypto crucis* subspecie *lanceolata* foliis adultis, alabastris fructibusque majoribus et cortice ad basin aspero crasso amorpho non "minniritchi" differt

*Typus*: Wardagga Hill, Ninghan Station, 22 km SW of Paynes Find, 29°23'S, 117°30'E, 27 Aug. 1991, S.D. Hopper 8132 & A.P. Brown (holo: PERTH; iso: AD, CANB, NSW).

It differs from subspecies *lanceolata* in the larger adult leaves, buds and fruits.

*Other specimens examined*. WESTERN AUSTRALIA: Type locality, 2 Aug. 1986, R. Peakall s.n. (J. Sampson 0088 and 0091) (PERTH); south of Paynes Find, 12 Aug. 1981, S.D. Hopper 1842 (PERTH); Wardagga Hill, 25 km SW of Paynes Find, 13 Jan. 1979, A. Southcott s.n. (PERTH); Wardagga Hill on Ninghan Stn, 60 miles NE of Wubin, 2 November 1982, A. Southcott s.n. (CANB).

*Distribution*. Only known from the type locality (Figure 11).

*Conservation status*. Vulnerable, declared as Rare Flora (species no. 134 in Hopper *et al.* (1990)).

*Flowering period*. Not known.

*Etymology*. From the Latin *praecipua* - special, in allusion to its distinct morphology and isozyme constituents.

*Notes*. Apart from the morphological distinction of the new subspecies, a study by Sampson *et al.* (1988) on isozymes showed that the maximum genetic distance between the morphologically similar subsp. *lanceolata* and subsp. *praecipua* was much larger than the distance of subsp. *lanceolata* from the morphologically dissimilar subsp. *crucis*.

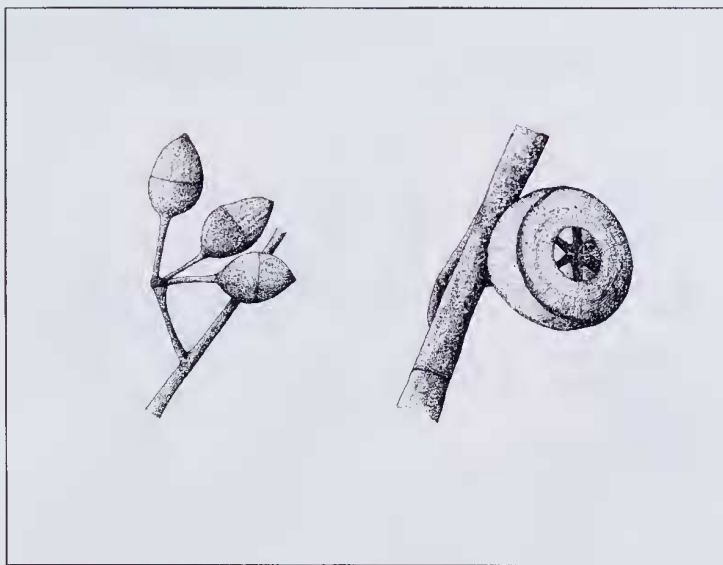


Figure 17. *E. crucis* subsp. *praecipua* - buds and fruit (Southcott s.n.)

**Eucalyptus ser. *Caesia*** Brooker & Hopper, ser. nov.

Dum corticem "minniritchee" conjunctim *E. ser. Orbifoliae* habens, *E. ser. Caesia* inflorescentiis 3-floribus, structura dissimili operculi et disco fructus verticaliter descendenti differt.

*Typus: E. caesia* Benth.

While having minniritchee bark in common with *E. ser. Orbifoliae*, *E. ser. Caesia* differs by the 3-flowered inflorescences, the vertically descending disc of the fruit and the different structure of the operculum which is formed by the upgrowth from the hypanthium of a ring of tissue which is itself surmounted by the true corolline operculum, the minute sepaline structures having aborted early (Drinnan & Ladiges 1989). This results in a "flange" (Brooker & Kleinig 1990) part way up the whole opercular structure which can be seen as well in *E. sturgissiana* Johnson & Blaxell of southern New South Wales. In fact, specimens of *E. caesia* lacking bark would not be recognised as having any resemblances to *E. ser. Orbifoliae*.

**Eucalyptus ser. *Heterostemones*** Benth., Fl. Austral. 3: 190, 209 (1867).

*Type: E. gracilis* F. Muell.

The series *Heterostemones* Benth. belongs in the informal *E.* subgenus *Symphyomyrtus* and is diagnosed by the following: mallee rarely tree, bark smooth or when rough typically tessellated, cotyledons bisected, pith of branchlets not glandular, adult leaves glossy with very acute basal venation, flowers with outer staminodes, ovules in 4 vertical rows, seeds with smooth coat and shallow longitudinal furrows.

**Key to the species of the *E. ser. Heterostemones***

1. Buds and fruit square in cross-section
  2. Hypanthium obconical in outline ..... 20. *E. quadrans*
  2. Hypanthium oblong or urceolate in outline
    3. Buds 4-sided, i.e. square in cross-section ..... *E. calycogona* var. *calycogona*
    3. Buds strongly 4- or 5-sided with angles very prominent (almost winged) ..... *E. calycogona* var. *spaffordii*
1. Buds and fruits round in cross-section
  4. Pedicels very slender, equal to or longer than pyriform bud ..... *E. yilgarnensis*
  4. Pedicels shorter than bud
    5. Adult leaves greyish or bluish green; branchlets glaucous; buds and fruits often glaucous ..... *E. celastroides* subsp. *celastroides*
    5. Adult leaves green; buds, fruits and branchlets not glaucous
      6. Fruits urceolate or contracted at the rim ..... *E. celastroides* subsp. *virella*
      6. Fruits cupular or barrel-shaped or slightly campanulate
        7. Peduncles 0.3-0.5 cm long; opercula conical to slightly beaked ..... *E. brevipes*
        7. Peduncles >0.5 cm long; opercula patelliform or conical ..... *E. gracilis*

**20. *Eucalyptus quadrans* Brooker & Hopper, sp. nov. (Figure 18)**

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 292 (1990).

Frutex "mallee" *Eucalypto gracili* F. Muell. affinis a qua cortice laevi, foliis juvenilibus tenuibus subtilibusque, alabastris fructibusque majoribus, et hypanthiis ad basin quadrangularibus in sectione transversali differt.

*Typus*: 3.3 km W of highway, SW of Truslove (Hawkey Road), 33°20'S, 121°40'E, 7 September 1984, M.I.H. Brooker 8670 (holo: PERTH; iso: CANB, NSW).

Mallee with affinity to *Eucalyptus gracilis* F. Muell. from which it differs in the smooth stems, thin, delicate juvenile leaves, larger buds and fruit, and hypanthium which is 4-sided in cross-section towards the base.

*Mallee* to 5 m tall with grey, creamy, greenish or coppery smooth bark. *Juvenile leaves* shortly petiolate, crowded, linear to narrowly lanceolate, to 6 x 0.6 cm, dull, glaucous. *Adult leaves* petiolate, alternating, narrowly lanceolate, to 10 x 1.3 cm, concolorous, glossy, green; side veins acute; reticulation dense, with numerous relatively large intersectional oil glands. *Inflorescences* axillary, unbranched, 7-flowered; peduncles more or less slender, angular in cross-section or somewhat flattened, to 1.5 cm long. *Buds* pedicellate, to 0.7 x 0.5 cm, hypanthium obconical in outline, 4-sided in cross-section, operculum variable, patelliform, pyramidal or slightly beaked. *Stamens* inflexed with outer long filaments barren, inner short filaments with anthers. *Fertile filaments* narrowing sharply at summit and anthers basifixed, cuboid to globose, opening by terminal pores. *Staminodes* much twisted in flower. *Flowers* creamy white. *Style* narrowed at base. *Ovules* in 4 vertical rows. *Fruits* pedicellate, obconical or oblong in outline, 4-sided in cross-section, to 0.7 x 0.7 cm; rim thin; disc broad, descending, often spreading inwards to the deeply sunken ovary roof; valves 4(5), included. *Seed* pale reddish brown, flattened ellipsoidal, smooth.

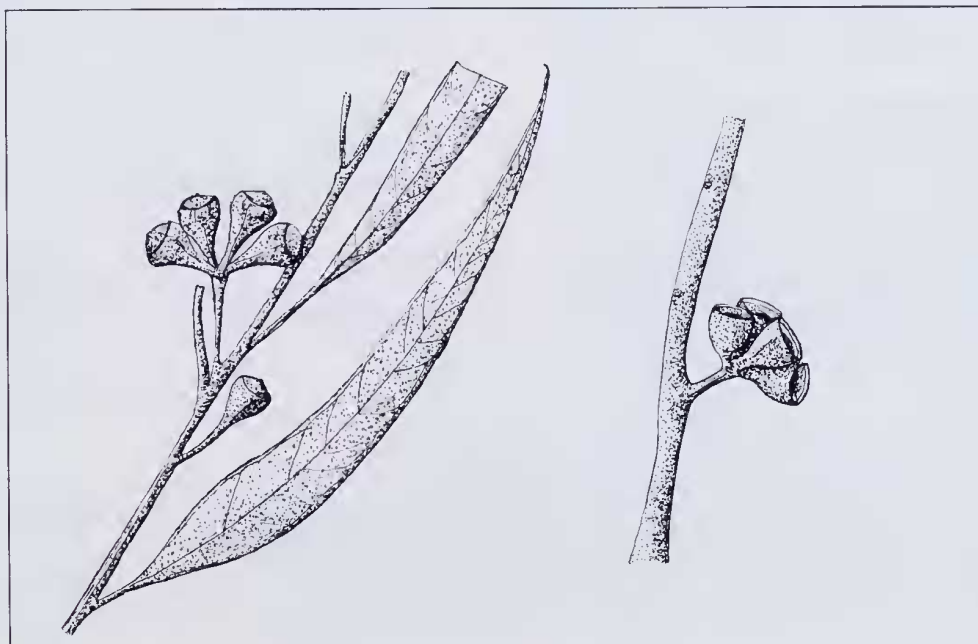


Figure 18. *E. quadrans* - buds (x1.2) and fruit (x1.1) (MIHB 8670)



*Other specimens examined.* WESTERN AUSTRALIA: 6 miles W of Norseman-Esperance Road on road to Lake King, 18 September 1971, *K. Allan* 769 (PERTH); 2½ miles E of Circle Valley, 25 April 1952, *P.H. Barrett* 8 (PERTH); 6 miles S of Salmon Gums, 16 September 1952, *P.H. Barrett* 42 (PERTH); 4 km along Mt Ney Road, NE of Kau Rock Road, 12 August 1982, *M.I.H. Brooker* 7553 (CANB, PERTH); NE of Esperance, 5 May 1984, *M.I.H. Brooker* 8663 (CANB, PERTH); c. 7 km along Kau Rock Road towards NW, 16 January 1983, *M.I.H. Brooker* 8791 (CANB, PERTH); 2 km NE of Mt Ridley t/o on Dempster Road, 9 April 1985, *M.I.H. Brooker* 8925 (CANB, PERTH); 7.2 km from Mt Ridley t/o going N, 5 November 1986, *M.I.H. Brooker* 9507 (CANB, MEL, NSW, PERTH); c. 10 km N of Grasspatch, 7 November 1986, *M.I.H. Brooker* 9523 (CANB, PERTH); 3.6 km from end of made road up Field's Road to N, 8 November 1986, *M.I.H. Brooker* 9526 (CANB, MEL, NSW, PERTH); NE of Esperance, 5 September 1984, *M.I.H. Brooker* 9663 (AD, CANB, NSW, PERTH); 3 km E of Geordie Rock, 27 March 1983, *M.A. Burgman* 1066 & *S. McNee* (PERTH); 17 km NW of Clyde Hill, 4 May 1983, *M.A. Burgman* 1237 & *S. McNee* (PERTH); 3.5 km WNW of Mt Burdett on Norwoods Road, 1 October 1983, *M.A. Burgman* 2563 & *S. McNee* (PERTH); 21 km NW of Clyde Rock, 13.4 km SE of Mt Ney Road on Clyde Rock Road, *M.A. Burgman* 3146 & *C. Layman* (PERTH); between Norseman and Salmon Gums at 520.6 m.p., 29 March 1968, *S.G.M. Carr* 624a (PERTH); Grasspatch, 31 March 1968, *S.G.M. Carr* 626 (PERTH); 0.9 miles S of Kumarl, 24 March 1968, *G.M. Chippendale* 390 (PERTH); 516 mile post on Norseman-Esperance Road, July 1972, *R.J. Edmiston* E30 (PERTH); Salmon Gums, 12 September 1964, *R.H. Kuchel* 1738 (AD); Scaddan, June 1973, *O. Loneragan* 50 (PERTH); 12 km E of Scaddan, 14 October 1982, *P. van der Moezel* 197 (PERTH); 16 km NE of Scaddan on Truslove Road, 13 September 1984, *P. van der Moezel* 483 (PERTH); 50 km E of Ravensthorpe, 22 February 1983, *K. Newbey* 9719 (PERTH); Young River c. 40 km from the coast, 16 December 1974, *R. Pullen* 10061 (CANB, PERTH); Pine Hills Rock-hole, between Mt Ragged and Balladonia, 18 December 1974, *R. Pullen* 10090 (PERTH); 4 miles S of Salmon Gums, 18 April 1953, *R.D. Royce* 4053 (PERTH); S of Circle Valley, Norseman-Esperance Road, 15 September 1962, *F.G. Smith* 1571 (PERTH).

*Distribution.* The hinterland of Esperance, at least as far as Mt Heywood to the north-east, and Salmon Gums in the north, Western Australia (Figure 11).

*Conservation status.* Common and widespread. Not considered to be endangered.

*Flowering period.* August-November.

*Etymology.* The name refers to the 4-sided lower part of the hypanthium (Latin *quadrans*).

*Notes.* As implied, the distribution limits of *E. quadrans* are not known as it occurs in relatively, unexplored country. To the west, i.e. towards Ravensthorpe, it appears to grade into a related, delicate small-budded and small-fruited form, again with the crowded feathery fine juvenile leaves. This taxon is being treated by others.

**Eucalyptus** ser. **Porantherae** Benth., Fl. Austral. 3:191, 213 (1867). Type: *E. uncinata* Turcz. lectotype, fide G.M. Chippendale, "Fl. Australia" 19: 503 (1988).

*E. ser. Normales* Benth., op. cit. 193, 223. p.p. Type: not designated.

*E. sect. Terminales* Maiden, "Crit. Rev. Gen. Eucalyptus" 6: 530 (1924). p.p. Type: not designated.

*E. ser. Fruticosa* Blakely, "Key to the Eucalypts" 53: 221 (1934). Type: not designated.

[*E. ser. Foecundae* Pryor & Johnson, "Class. of the Eucalypts" 47: (1971), nom. inval. Type: *E. foecunda* Schauer].

The *E. ser. Porantherae* belongs in the informal *E. subgenus Symphyomyrtus* and is diagnosed by the following: tree or mallee, bark smooth rarely rough, cotyledons bisected, pith of branchlets not glandular, adult leaves glossy green with dense reticulation, stamens inflexed, clavate towards top with completely adnate anthers, ovules in 4 vertical rows, rim of fruit thick with whitish disc, seeds with smooth coat and shallow longitudinal furrows.

The *Porantherae* were recently treated by Brooker (1988) (as "*E. ser. Foecundae*") and this single new species may be entered in the key as follows:

9. Bark smooth

- "10" Crown of adult leaves somewhat olive-green, leaf edges slightly crenulate; juvenile leaves linear-oblong, glaucous ..... 21. *E. olivina*
- "10" Crown of adult leaves green, leaf edges entire; juvenile leaves linear to orbicular, green to glaucous
- 10 etc.

**21. *Eucalyptus olivina* Brooker & Hopper, sp. nov. (Figure 19)**

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 419 (1990).

Arbor vel frutex "mallee" ad *Eucalyptum* seriem *Porantheras* Benth. pertinens ad 4 m altus cortice laevi cinereo. Folia adulta petiolata, alternantia, angusto-lanceolata vel falcata, ad 8 x 0.8 cm, marginibus interdum plus minusve crenatis, leviter nitentia, pallido-viridia vel olivacea. Inflorescentiae axillares, non ramosae, pedunculis ad 0.7 cm longis. Alabastra fusiformia. Fructus pedicellati quadrangules, cupulati, ad 0.4 x 0.4 cm, disco annulato rimosis radiatis, vel descendentibus, albido.

*Typus:* At turn-off to Lake Cronin between Cross Roads and Mt Holland, E of Hyden, 32°23'S, 119°45'E, 22 July 1988, M.I.H. Brooker 10011 & C.J. Ranford (holo: PERTH; iso: AD, CANB, MEL, NSW).

*Tree or mallee* to 4 m tall with smooth grey bark. *Seedling axis* verruculose. *Seedling and juvenile leaves*, sessile, remaining decussate for many pairs, linear-oblong, boat-shaped, to 3.5 x 0.8 cm, glaucous. *Adult leaves* petiolate, alternating, narrowly lanceolate or sometimes falcate, to 8 x 0.8 cm, concolorous, slightly glossy, light green to olive green, with margins more or less crenulate; reticulation dense, with numerous intersectional oil glands. *Inflorescences* axillary, unbranched, 7-11 flowered; peduncles to 0.7 cm long. *Buds* fusiform, to 0.7 x 0.3 cm; operculum conical to slightly beaked. *Stamens* inflexed, all fertile; anthers adnate, basifixed, opening by terminal pores. *Flowers* not seen. *Ovules* in 4 vertical rows. *Fruits* shortly pedicellate, cupular, to 0.4 x 0.4 cm; rim thick; disc annular with radial splits, or descending, whitish; valves 3, just exerted. *Seed* grey, compressed-ovoid, smooth, with shallow longitudinal furrows.

*Other specimens examined.* WESTERN AUSTRALIA: 16.4 miles W of Coolgardie-Norseman road on Hyden track, 19 Sep. 1971, K.M. Allan 774 (PERTH); 291 mile peg on Hyden-Norseman track, 20 Sep. 1971, K.M. Allan 788 (PERTH); 283 m.p. on Hyden-Norseman track, 20 September 1971, K. Allan 790 (PERTH); 2.3 miles N of Hyden-Norseman track on RPF, 22 September 1971, K. Allan 812 (PERTH); 26 miles N of Lake Grace, 4 May 1959, T.E.H. Aplin 478 (PERTH); 40 miles SW of Peak Charles, 29 Mar. 1970, J.S. Beard 5866 (PERTH); 16.2 km NNW of Hyden towards Narambeen,

4 October 1975, *M.I.H. Brooker* 4995 (CANB, PERTH); 2 km S of Hyden-Norseman Road, 6 km W of Cross Roads, 11 August 1979, *M.I.H. Brooker* 6319 (CANB, PERTH); 34 km from Narambeen on Hyden Road, 12 August 1979, *M.I.H. Brooker* 6327, 6328 (CANB, PERTH); road from The Humps to Mt Walker, 31 December 1979, *M.I.H. Brooker* 6742 (CANB, PERTH); 17.7 km E of grid in RPF east of Hyden, 9 August 1984, *M.I.H. Brooker* 8624 (PERTH); 1.6 km N of Hyden track, 9 Aug. 1984, *M.I.H. Brooker* 8630 (CANB, PERTH); N of Hyden, 32°15'S, 118°55'E, 19 December 1984, *M.I.H. Brooker* 8767 (CANB, NSW, PERTH); between road and Dragon Rock, 21 Oct. 1986, *M.I.H. Brooker* 9477 (PERTH); 21.1 km SE from E Hyden Bin Road on Lake King Road, W of Hurlstone, 21 July 1988, *M.I.H. Brooker* 10010 (CANB, PERTH); 26.6 km S of Cross Roads, E of Hyden (32°40'S, 119°47'E), 22 July 1988, *M.I.H. Brooker* 10015 & *C.J. Ranford* (AD, CANB, MEL, NSW, PERTH); 1.2 km W of gate on Lake Varley Road, 22 July 1988, *M.I.H. Brooker* 10020 (CANB, PERTH); W of N Ironcap, E of Hyden, 24 August 1988, *M.I.H. Brooker* 10051 (CANB, PERTH); 16 km N of Moolyall Rocks, on Hayes Road, 25 Mar. 1983, *M.A. Burgman* 1033 & *S. McNee* (PERTH); R. Smith's NE site, Lake Cronin, 8 December 1966, *S. Chambers* 177 (PERTH); site 68 along State Vermin Fence No 7, 100 km SE of Southern Cross, 8 October 1986, *J. Dodd* 314 (PERTH); Harrismith, 5 Mar. 1924, *C.A. Gardner* 2106 (PERTH); Lake Cronin, 85.7 km E of Hyden, ENE side of Lake Cronin, 23 September 1989, *N. Gibson* 3 (PERTH); 20 km N of Hyden, 19 Oct. 1987, *J.W. Green* 5528 (PERTH); E of North Ironcap on Forrestania-Southern Cross Road, 20 October 1987, *J.W. Green* 5555 (PERTH); 69 km E of Hyden, 20 Oct. 1987, *J.W. Green* 5562 (PERTH); 19 km N of Holt Rock, 17 September 1976, *R. Hnatiuk* 760846 (PERTH); 16 km SE of Kulin, 5 July 1977, *R.J. Hnatiuk* 770079 (PERTH); 6.3 km SW of McDermid Rock, 13 February 1981, *G.J. Keighery* 3814 (PERTH); Frank Hann Nat. Park, 7 Aug. 1978, *D. Monk* 300 (PERTH); Frank Hann Nat. Park, 12 October 1978, *D. Monk* 392 (PERTH); 305 mile peg on Norseman-Hyden Road, 7 Sep. 1973, *E.C. Nelson* ANU 17336 (PERTH); 65 km E of Lake King on road to Daniell, 12 Sep. 1973, *E.C. Nelson* ANU 17259 (PERTH); 5 miles NE of Lake King, 4 December 1970, *K. Newbey* 3335 (PERTH); 35 km SW of McDermid Rock, 15 July 1979, *K.R. Newbey* 5300 (PERTH); 2 km W of Sunday Soak, ca. 65 km NNW of Norseman, 17 July 1979, *K.R. Newbey* 5335 (PERTH); 0.5 miles E of Newdegate on road to Lake King, 28 Aug. 1973, *M.T. Tindale* 3765 (NSW, PERTH); Lake King Road, 15 miles E of Newdegate, 27 Nov. 1974, *E.W. Wittwer* 1479 (PERTH).

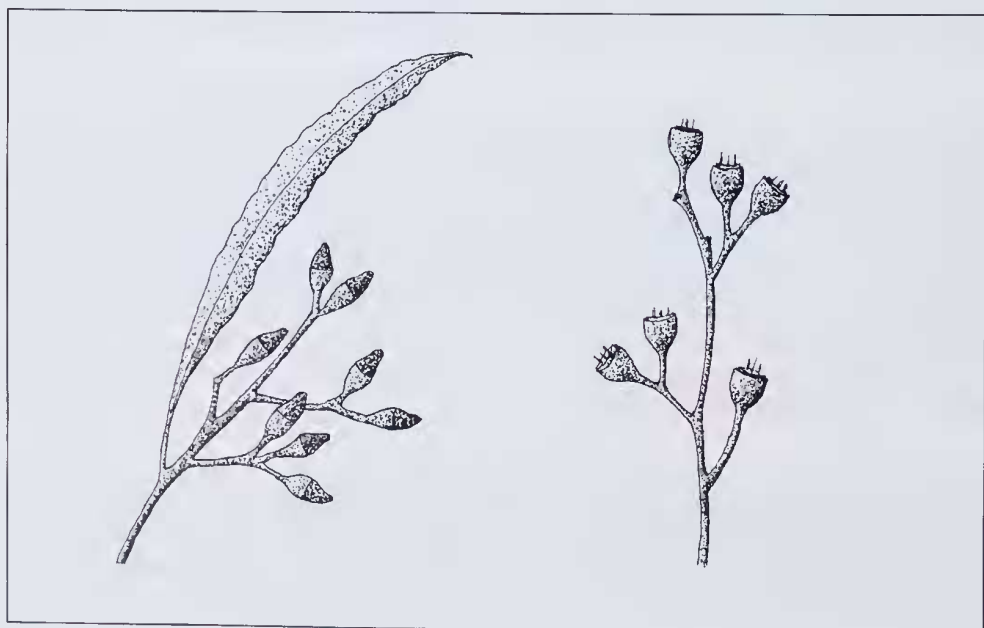


Figure 19. *E. olivina* - buds and fruit (*MIHB* 4995)

*Distribution.* South-eastern wheatbelt to well east of Hyden (Figure 11).

*Conservation status.* Common and widespread. Not considered to be endangered.

*Flowering period.* Not known.

*Etymology.* From the Latin *olivinus* - olive-coloured, referring to the leaves.

*Notes.* *E. olivina* favours deep reddish sands. It may be recognised by the mallee habit, smooth stems, slightly olive-green crown and crenulate leaves. The pedicels of the fruit are often angular with the angles extending just to the base of the hypanthium, showing a probable relationship to *E. kumarlensis* Brooker to the east and which has green juvenile leaves. Of other species in the series, it is replaced by *E. rigidula* Maiden in the north, *E. hypochlamydea* Brooker to the west and *E. perangusta* Brooker to the south.

**Eucalyptus** ser. **Rufispermae** Maiden, "Crit. Revis. Gen. *Eucalyptus*" 7:152 (1929).

*Type:* *E. woodwardii* Maiden

The *E. ser. Rufispermae* belongs in the informal *E. subgenus Symphyomyrtus* and is diagnosed as follows: tree, mallet or mallee, bark rough or smooth, cotyledons reniform, pith of branchlets glandular, juvenile leaves petiolate, adult leaves dull or glossy with veins and veinlets somewhat repand, inflorescences 3- or 7-flowered (rarely more), stamens inflexed, all fertile, anthers versatile, sub-basifixed, cuboid, opening by longitudinal slits, ovules in 4 vertical rows, seed lustrous ruby red, flattened, with shallow reticulum, hilum ventral.

The series *Rufispermae* is probably the largest in the genus with more than 50 taxa. As the majority are yet to be described it would be of little value, as for the *Subulatae* earlier, to provide a key to the published species only.

**22. *Eucalyptus georgei* Brooker & Blaxell subsp. *fulgida* Brooker & Hopper, subsp. nov. (Figure 20)**

Brooker & Kleinig, "Field Guide to *Eucalypts*" 2: 419 (1990) as *E. fulgida*.

A subspecies typica foliis adultis non glaucis et viridibus nitentibus et fructibus minoribus brevioribus differt.

*Typus:* 8.2 km E of Cross Roads, E of Hyden, 32°24'S, 119°50'E, 21 October 1986, M.I.H. Brooker 9482 (holo: PERTH; iso: AD, CANB, MEL, NSW).

It differs from the typical subspecies by the non-glaucous, shiny green leaves and the smaller, shorter fruits.

*Tree* to 20 m tall with completely smooth pale coppery bark with much ribbining in season. Forming *lignotubers*. *Juvenile leaves* petiolate, alternating, ovate, to 12 x 6 cm, dull, glaucous. *Adult leaves* petiolate (petioles to 3.5 cm long, minutely warty), alternating, lanceolate or falcate, to 15 x 2.5 cm, glossy, green; reticulation very dense, veinlets sinuate, with numerous very irregular intersectional



oil glands. *Inflorescences* axillary, unbranched, glaucous, 7-flowered; peduncles stout, angular, to 1 cm long. *Buds* on short, stout angular pedicels, shortly clavate, to 1 x 0.7 cm; operculum hemispherical. *Flowers* creamy white. *Fruits* subsessile to shortly pedicellate, obconical, to 1 x 1.2 cm; rim thick with broad ascending, inner operculum scar; valves 5, not exserted.

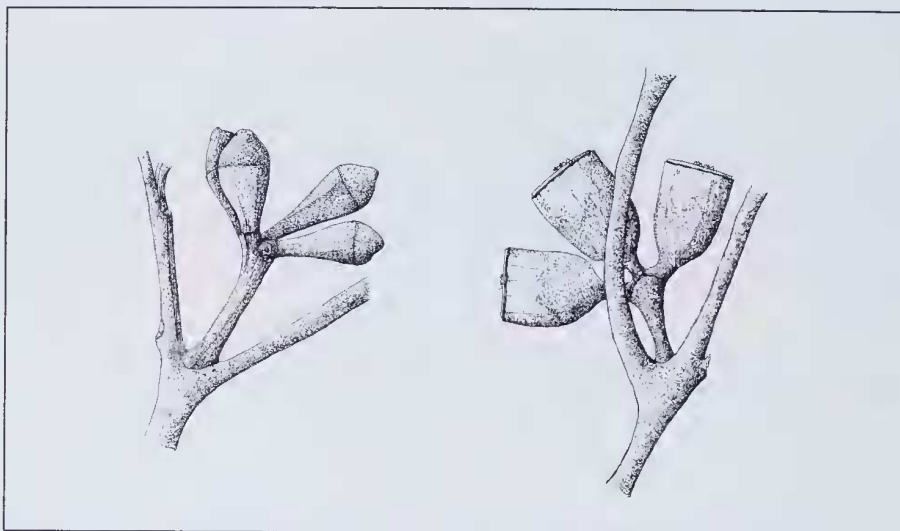


Figure 20. *E. georgei* subsp. *fulgida* - buds (MIHB 10069) and fruit (MIHB 10071)

*Other specimens examined.* WESTERN AUSTRALIA: 1.5 and 4.7 km N of Hyden-Norseman track from 8.6 km E of Cross Roads, 24 August 1988, *M.I.H. Brooker* 10069, 10071 (AD, CANB, MEL, NSW, PERTH); E of Mount Holland, July 1930, *C.A. Gardner s.n.* (PERTH); 6 Feb. 1981, *G.J. Keighery* 3771 (PERTH); Mt Holland area, 16 Aug. 1966, *A. Kessell* 408 (PERTH); near Lake Cronin, 4 July 1979, *K.R. Newbey* 5205 (PERTH); 6.5 km E of Lake Cronin, 21 July 1981, *K.R. Newbey* 8332 (PERTH); 62 km ENE of Lake King, 23 Aug. 1982, *K.R. Newbey* 9711 (PERTH).

*Distribution.* East of Hyden in uncleared vegetation (Figure 21).

*Conservation status.* Poorly known and in need of further survey (Priority 2 (as *E. aff. georgei*) in Hopper *et al.* (1990)) on reserve flora list.

*Flowering period.* Not known.

*Etymology.* From the Latin *fulgidus* - shining.

*Notes.* *E. georgei* subsp. *fulgida* is easily recognised in the field by the slender smooth erect trunks, and the crown of large thick glossy green leaves. The buds and fruits may or may not be glaucous. It occurs in more or less pure stands and is notable in season, because of its stature compared with most other taxa in the series *Rufispermae*, and for the long ribbons of partly shed bark.

### 23. *Eucalyptus tenuis* Brooker & Hopper, sp. nov. (Figure 22)

Brooker & Kleinig, "Field Guide to *Eucalypts*" 2: 330 (1990).



Arbor parva ("mallet") ad 8 m alta *Eucalypto pileatae* Blakely affinis a qua constanter habitu arboreo, caulibus gracilibus, inflorescentiis 3 vel 7-floribus, pedicellis longioribus et fructibus obconicis vel campanulatis differt.

*Typus*: 15.2 km south of Nepean Mine on Burra Rock Road, 31°18'S, 121°08'E, 12 Nov. 1983, M.I.H. Brooker 9075 (holo: PERTH; iso: CANB, NSW).

Mallet or rarely mallee to 8 m tall with affinity to *Eucalyptus pileata* Blakely from which it differs in the constant tree (mallet) form, slender stems, 3- or 7-flowered inflorescences, longer pedicels, and obconical to campanulate fruits.

Whipstick mallet or more rarely erect-stemmed *mallee* to 8 m tall with grey over pale salmon-coloured smooth bark, often partly shed and hanging in ribbons. *Juvenile leaves* petiolate, alternating, narrowly lanceolate to lanceolate, to 12 x 1.5 cm, concolorous, glossy, bright green, ovate, to 7 x 4.5 cm. *Adult leaves* petiolate, alternating, reticulation dense with numerous large, irregular, intersectional oil glands. *Inflorescences* axillary, unbranched, 3 or 7-flowered; peduncles terete or slightly flattened, 0.8-5 cm long, often pendulous. *Buds* on distinct, often long pedicels, ribbed, clavate, to 1.1 x 0.8 cm; operculum conical. *Flowers* not seen. *Fruits* pedicellate, obconical, to 1 x 1 cm; rim thick; disc level to obliquely descending; valves 4(5), to rim level.

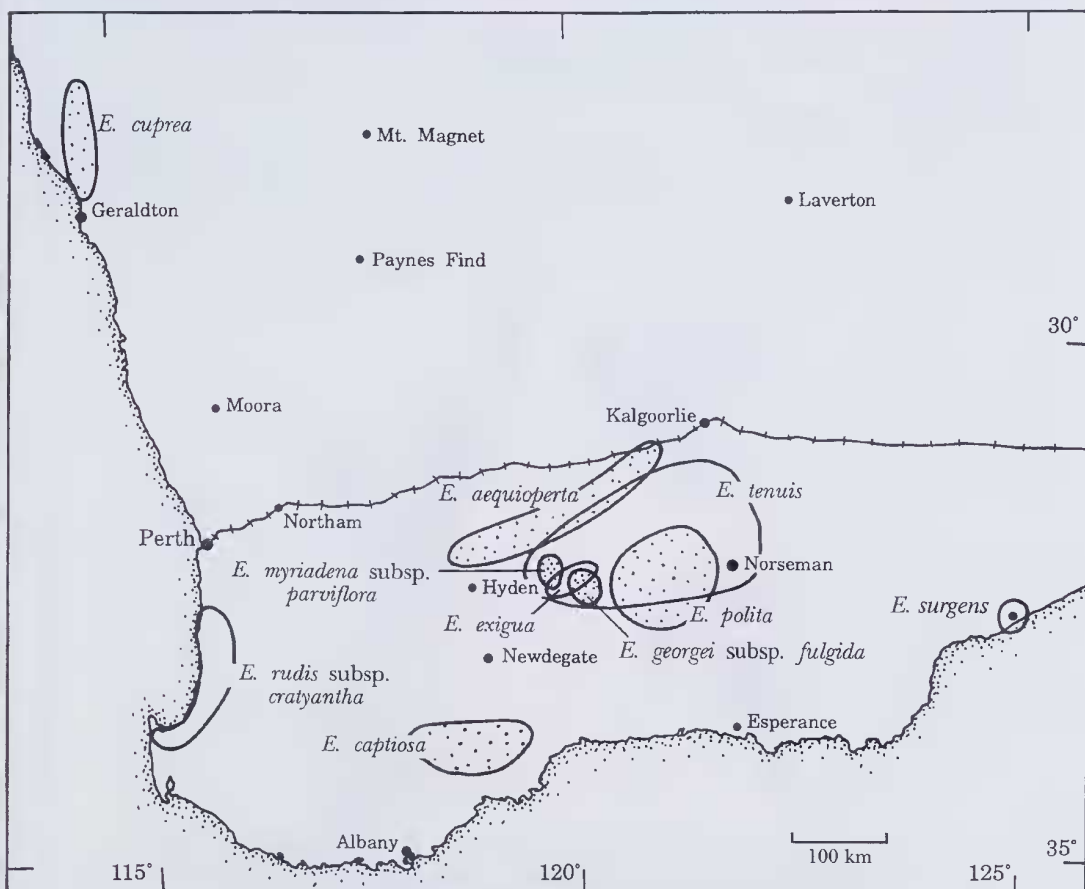


Figure 21. Distribution of taxa Nos 22-26, 28-32.

*Other specimens examined.* WESTERN AUSTRALIA: 5 km NE of Norseman PO,  $\pm$  1 km N of Eyre Highway, 29 August 1974, A.C. Beauglehole 49392 (PERTH); 9 km N of Hyden-Norseman track on Mt Day Road, 7 November 1983, M.I.H. Brooker 8356 (CANB, NSW, PERTH); NE of Mt Day, 32°07'S, 120°31'E, 6 April 1985, M.I.H. Brooker 8901 (PERTH); NW of North Ironcap, 24 August 1988, M.I.H. Brooker 10053 (AD, CANB, MEL, NSW, PERTH); between Boorabbin and Bullabulling, 21 Nov. 1991, M.I.H. Brooker 10891 (AD, CANB, MEL, NSW, PERTH); 10.4 km N of BP petrol station on Kambalda East and West road, on road to Kalgoorlie, 23 Nov. 1991, M.I.H. Brooker 10898 (AD, CANB, MEL, NSW, PERTH); 12 km ENE of Mt Thirsty in the Norseman district, July 1985, N. Caporn s.n. (PERTH); 8.8 km N of Hyden-Norseman track along Mt Day track, 7 Nov. 1983, K. Hill 624, L. Johnson, D. Blaxell, I. Brooker & S. Hopper (CANB, NSW, PERTH); 315-332 mile pegs on Hyden-Norseman track, 16 Aug. 1966, A. Kessell 425 (PERTH); 3 miles E of Hatters Hill, 9 Dec. 1964, F. Lullfitz 3981 (PERTH); 1 mile W of Lake Cronin, 4 December 1970, K. Newbey 3326 (CANB, PERTH); 1 km N of Mt Day, c. 121 km W of Norseman, 14 July 1979, K. Newbey 5269 (PERTH); 32 km SW of McDermid Rock, c. 116 km W of Norseman, 15 July 1979, K.R. Newbey 5301 (PERTH); 20 km SW of McDermid Rock, 26 Mar. 1980, K.R. Newbey 6776 (PERTH); 6 km SSE of Boorabbin, c. 96 km E of Southern Cross, 25 July 1981, K.R. Newbey 8351 (PERTH); 4.8 km S of Boorabbin, c. 90 km E of Southern Cross, 26 Sep. 1982, K.R. Newbey 9619 (PERTH).

*Distribution.* Sporadically but widely distributed in the scrub between Hyden and Norseman and north towards Coolgardie, Western Australia (Figure 21).

*Conservation status.* Common and under no major threat.

*Flowering period.* Not known.

*Etymology.* The name refers to the notably slender stems of the species at the type locality (Latin *tenuis* - slender).

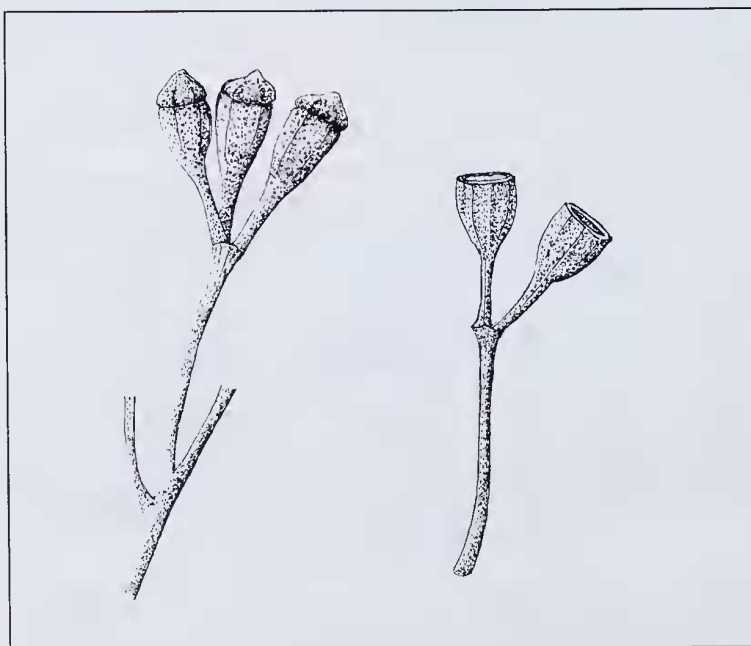


Figure 22. *E. tenuis* - buds and fruit (MIHB 10053) (x1.2)

*Notes.* *E. tenuis* is usually an attractive mallet, a habit form rare in the series. It is also unusual in the series *Rufispermae* for the occurrence of 3-flowered inflorescences. The peduncles are often pendulous. It is very variable in the pedicels which can be the longest in the series.

**24. *Eucalyptus polita* Brooker & Hopper, sp. nov. (Figure 23)**

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 338 (1990).

Arbor parva ad 9 m alta cortice laevi. Ramuli leviter glauci. Folia adulta anguste lanceolata, ad 13 x 1.3 cm, hebetia vel leviter nitentia, viridia. Inflorescentiae axillares, non ramosae, 7-florae. Alabastra pedicellis brevibus crassis, vel plus minusve sessilia, ad 0.8 x 0.4 cm, operculo conico vel leviter rostrato costatoque. Fructus obconici vel cupulati, ad 0.5 x 0.4 cm.

*Typus:* 62.7 km west of Mt Day Road on Hyden-Norseman track, 32°21'S, 119°54'E, 7 November 1983, M.I.H. Brooker 8361 (holo: PERTH; iso: AD, CANB, MEL, NSW).

*Small tree* to 9 m tall or rarely mallee, with grey, whitish grey, yellow-green or pinkish grey smooth bark becoming salmon pink to coppery. *Branching habit* sometimes steep. *Branchlets* red, slightly glaucous. *Juvenile leaves* petiolate, alternating, ovate, to 10 x 6 cm, dull, blue-green to glaucous. *Adult leaves* petiolate, alternating, narrowly lanceolate, to 13 x 1.3 cm, concolorous, at first dull, maturing slightly glossy green; reticulation dense, with scattered intersectional oil glands. *Inflorescences* axillary, unbranched, 7-flowered; peduncles slightly angular, 0.6 - 0.9 cm long. *Buds* shortly, thickly pedicellate or more or less sessile, ovoid, 0.6-0.8 x 0.3-0.4 cm; operculum conical to slightly beaked, slightly ribbed. *Flowers* not seen. *Fruits* subsessile to shortly pedicellate, obconical to cupular, 0.4-0.5 x 0.3-0.4 cm; disc obliquely descending, often whitish; valves 3 or 4, slender, often slightly exerted.

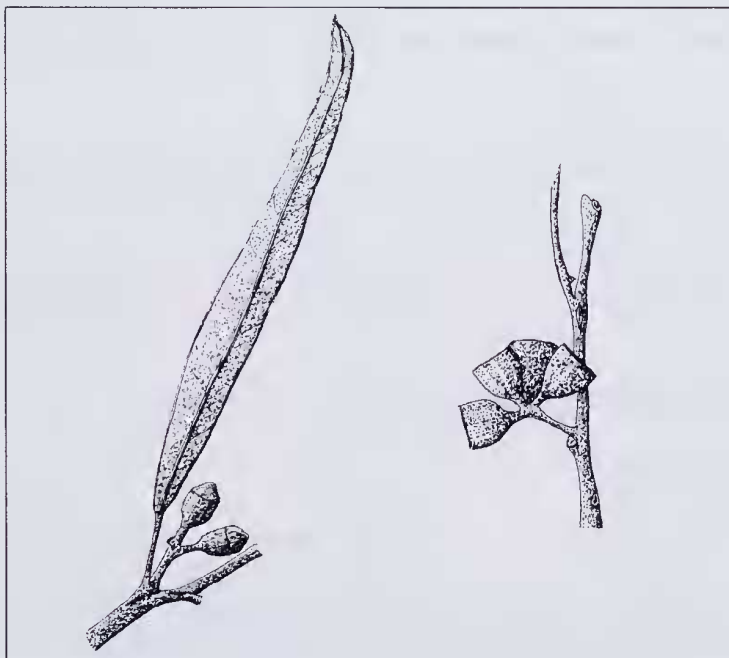


Figure 23. *E. polita* - buds (MIHB 7060) and fruit (MIHB 8361) (x1.2)

*Specimens examined.* WESTERN AUSTRALIA: Eyre Highway, 2.8 miles N of Daniell Siding, 16 Nov. 1970, *J. Baker* 81 (CANB, PERTH); 1.5 miles S of Daniell Siding, 23 Apr. 1952, *P.H. Barrett* 1 (PERTH); 90 mile tank/Kumarl Road, E of Bremer Range, Mar. 1983, *K. Brady* 18 (PERTH); 1.5 miles S of Daniell Siding, 17 July 1952, *P.H. Barrett* 12 (PERTH); 11 miles NW of 90 mile tank, NW of Salmon Gums, 17 Dec. 1970, *M.I.H. Brooker* 2518 (PERTH); c. 6 miles by road from Norseman-Coolgardie Road, 6.6 km from Norseman, 6 April 1974, *M.I.H. Brooker* 4539 (CANB, PERTH); 5.5 km W of highway on track 15 km S of Hyden t/o, 9 Nov. 1981, *M.I.H. Brooker* 7060 (CANB, PERTH); 5.6 km W of Coolgardie-Norseman Road, 32°09'S, 121°37'E, 6 Nov. 1983, *M.I.H. Brooker* 8349 (AD, CANB, MEL, NSW, PERTH); 34 km WNW of Salmon Gums, 11 May 1983, *M.A. Burgman* 1316 & *S. McNee* (PERTH); 16.4 km W of Peak Charles turn-off on Lake King Road, 8 Nov. 1986, *M.I.H. Brooker* 9536 (CANB, PERTH); c. 55 km SSW of Norseman, 5 km from highway towards Peak Charles, 20 Sep. 1979, *M.D. Crisp* 5954 (PERTH); 8 miles north westward from Norseman, 6 Nov. 1953, *C.A. Gardner* 11153 (PERTH); 5.6 km W of highway on track turning off 11 km N of Norseman, 6 Nov. 1983, *K. Hill* 589, *L.A.S. Johnson*, *D.F. Blaxell* (NSW, PERTH); 17 km WNW of 90 Mile Tank, 21 km SW of Mt Glasse, Bremer Range, 6 Sep. 1982, *S.D. Hopper* 2497 (PERTH); Kumarl, Apr. 1938, *L. Horbury s.n.* (PERTH); Woodline, c. 85 km ENE of Norseman, 7 Aug. 1980, *G.J. Keighery* 2979 (PERTH); 31 miles E of 90 mile tank, 24 May 1955, *A.R. Main* 04746 (PERTH); Woolyeener Hill, 6 km S of Norseman, 14 Mar. 1980, *K.R. Newbey* 6742 (PERTH); 2 km NE of Peak Charles, c. 46 km WNW of Salmon Gums, 21 Mar. 1980, *K.R. Newbey* 6762 (PERTH); Peak Charles Nat. Park, 23 Mar. 1980, *K. Newbey* 6769 (PERTH); 30 km ESE of Sinclair Soak, c. 75 km NE of Norseman, 6 Aug. 1980, *K. Newbey* 6959 (PERTH); 19 km ENE of Norseman, 21 Sep. 1980, *K. Newbey* 7534 (PERTH); 75 km NE of Norseman, 21 Aug. 1982, *K. Newbey* 9710 (PERTH); Brockway Timber Reserve near Norseman, Jan. 1989 *L.M. Sandiford s.n.* (PERTH); between Lake King and Norseman, *A. Stewart s.n.* (PERTH).

*Distribution.* North-west of Norseman, the Johnston Lakes area and south towards Peak Charles, Western Australia (Figure 21).

*Conservation status.* Common and widespread.

*Flowering period.* Not known.

*Etymology.* From the Latin *politus* - polished, smooth, in reference to the bark compared with the related rough-barked species, *E. kondininensis* Maiden & Blakely and *E. clelandii* Maiden.

*Notes.* *E. polita* has been confused with *E. clelandii* (Maiden) Maiden but is distinguished by the completely smooth stems or trunk, glossy leaves and shortly pedicellate or sessile smaller buds and fruit.

**Eucalyptus** ser. **Torquatae** Chippendale, Fl. Australia 19: 506 (1988).

*Type:* *E. torquata* Luehm.

The *E. ser. Torquatae* belongs in the informal *E. subgen. Symphyomyrtus*. It is diagnosed by the following: tree or mallee, bark rough or smooth, cotyledons reniform, pith of branchlets glandular, juvenile leaves petiolate, adult leaves glossy except for one species, inflorescences 3-, 7-, or 11-flowered, stamens inflexed, all fertile except in one species, anthers versatile, sub-basifixed, oblong, opening by longitudinal slits, ovules in 4 vertical rows, seed grey to grey-brown, compressed-ovoid, deeply pitted on the dorsal side and toothed around the edges, hilum ventral.

Key to species of *E. ser. Torquatae*

- 1. Leaves dull ..... *E. torquata*
- 1. Leaves glossy
  - 2. Inflorescences 3-flowered
    - 3. Tree ..... *E. corrugata*
    - 3. Mallee ..... *E. griffithsii*
  - 2. Inflorescences 7- to 11-flowered
    - 4. Operculum narrower than hypanthium
      - 5. Fruit to 0.8 x 0.8 cm ..... *E. brachycalyx*
      - 5. Fruit to 1.5 x 1 cm ..... *E. rugosa*
    - 4. Operculum equal to or wider than hypanthium
      - 6. Operculum conical, as wide as hypanthium
        - 7. Fruit obconical with exserted, out-turned valves ..... *E. melanoxydon*
        - 7. Fruit barrel-shaped or cylindrical with valves to rim level ..... *E. sp.W\**
      - 6. Operculum hemispherical to flattened or cap-shaped and beaked
        - 8. Operculum hemispherical to flattened; peduncle >0.5 cm long ..... *E. concinna*
        - 8. Operculum cap-shaped, beaked; peduncle to 0.5 cm long ..... 25. *E. surgens*

\* This taxon is to be described by others. The letter code is that used in Brooker & Kleinig (1988).

## 25. *Eucalyptus surgens* Brooker & Hopper, sp. nov. (Figure 24)

Inter species seriei *Torquatarum* distinguitur pedunculis brevis crassis (ad 5mm longis), alabastris hypanthio campanulato et operculo rostrato, staminodiis, et fructibus sessilis, cupulatis vel cylindricis, cicatrice prominenti ad apicem.

*Typus*: Toolinna Cove, ca. 1 km north of coastal cliffs, 20 August 1989, S.D. Hopper 7340 (holo: PERTH; iso: CANB, NSW).

Spreading *mallee* to 2.5 m tall with rough bark near base of trunks. Forming *lignotubers*. *Cotyledons* reniform. *Seedling leaves* petiolate, opposite for 2-4 pairs, then alternating, elliptical then broadly lanceolate to ovate, 5.5-6 x 2.5-3.5 cm, dull, blue-green. *Adult leaves* petiolate, alternating, lanceolate to broadly lanceolate, to 10 x 2 cm, concolorous, glossy, light green. Inflorescences axillary, unbranched, 7-flowered; peduncles short, thick, slightly angular, terete, 0.3 - 0.5 cm long. *Buds* shortly pedicellate, hypanthium campanulate, operculum cap-shaped and beaked, shorter than hypanthium, 1.5 x 0.8 cm, outer operculum shed early; *stamens* inflexed, outer filaments without anthers; anthers versatile, dorsifixed, oblong, opening by longitudinal slits; *flowers* creamy yellow. *Ovules* in 4 vertical rows. *Fruits* more or less sessile, cupular to cylindrical, to 1.2 x 0.9 cm; rim with prominent vertical operculum scar; disc descending; valves 4, below rim level. *Seed* dark brown, compressed-ovoid, pitted.

*Distribution*. Known only from the type locality on the coastal edge of the Nullarbor Plain. The type population grows with *E. angulosa* Schau., *E. discreta* Brooker and *E. brachycalyx* Blakely on



gradually rising ground adjacent to a flat on the edge of coastal sand-ridges in powdery brown loam and scattered limestone (Figure 21).

*Conservation status.* Poorly known and in need of further survey.

*Flowering period.* August-?November.

*Etymology.* From the Latin *surgens* (rising) alluding to the conspicuous vertical scar on the rim of the fruit.

*Notes.* The buds and fruits of *E. surgens* resemble those of *E. platycorys* but the two species belong to different taxonomic series based on seed morphology. The series for the latter species has not been formally published. The most striking distinction of the new species in relation to all other species in the informal section *Dumaria* is the presence of staminodes. Staminodes throughout the genus *Eucalyptus* are a strong diagnostic feature for taxonomic series, for example, *E. ser. Heterostemones* (*E. gracilis* and related species). The existence of a species in *Dumaria* with unique qualitative character, although seen elsewhere in the eucalypts, can be seen also with *E. pimpiniana* which has unique leaf architecture for the section. These instances emphasise the independent accession of characters of no recognised adaptive value in series throughout the genus.

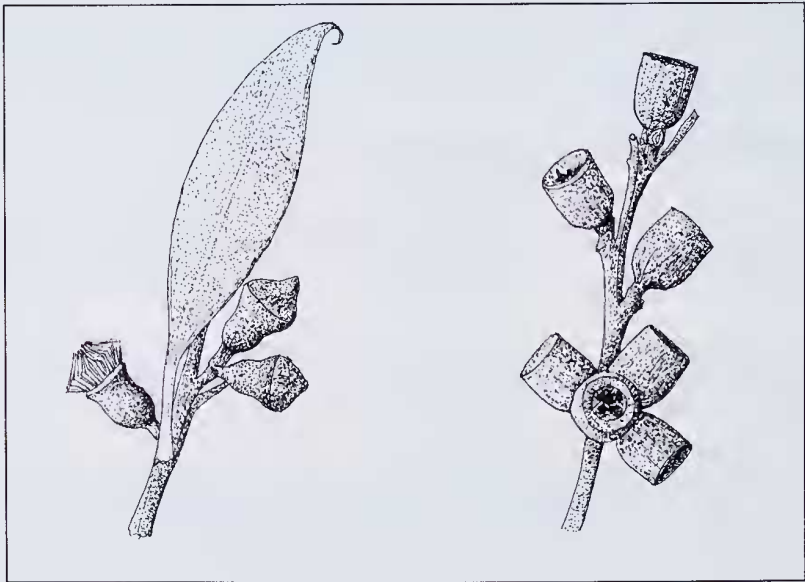


Figure 24. *E. surgens* - buds and fruit (SDH 7430)

***Eucalyptus* ser. *Tetrapterae*** Blakely, "A Key to the Eucalypts" 15: 73 (1934).

*Type:* *E. tetraptera* Turcz.

The *E. ser. Tetrapterae* belongs to the informal *E.* subgen. *Symphyomyrtus* and is diagnosed as follows: tree, mallee, mallee or shrub, bark smooth, pith of branchlets with or without oil glands, cotyledons reniform, juvenile leaves petiolate, adult leaves glossy green or olive-green, firm to very

thick, inflorescences 1-, 3-, or 7-flowered, stamens inflexed, ovules in 4-8 vertical rows, seeds usually black, flanged and shallowly pyramidal, with ventral side ribbed.

**Key to species of *E. ser. Tetraapterae***

- 1. Inflorescences 1-flowered
  - 2. Straggly shrub with very thick adult leaves to 25 x 7 cm; buds and fruit very big, square in cross-section, rigidly down-turned ..... *E. tetraaptera*
  - 2. Erect mallet; adult leaves to 10 cm long; buds and fruit pendulous
    - 3. Buds and fruits square in cross-section
      - 4. Operculum to 1 cm long, pyramidal or hemispherical or flattened, usually wider than long ..... *E. forrestiana*
      - 4. Operculum, >1.2 cm long, beaked, longer than wide ..... 27. *E. dolichorhyncha*
    - 3. Buds and fruits round in cross-section apart from strong multiple ribbing ..... *E. stoatei*
- 1. Inflorescences 3- or 7-flowered
  - 5. Buds and fruits square in cross-section; buds to 2.8 x 1.3 cm; fruit to 2.6 x 1.8 cm ..... *E. erythrandra*
  - 5. Buds and fruits round in cross-section
    - 6. Adult leaves to 1 cm wide ..... 26. *E. captiosa*
    - 6. Adult leaves >1 cm wide
      - 7. Fruits to 1.3 x 1.3 cm, smooth or slightly ribbed ..... *E. incrassata*
      - 7. Fruits to 2 x 2 cm, coarsely ribbed
        - 8. Fruits contracted around middle; inland on red sand ..... *E. ceratocorys*
        - 8. Fruits not contracted around middle; coastal ..... *E. angulosa*

**26. *Eucalyptus captiosa* Brooker & Hopper, sp. nov. (Figure 25)**

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 419 (1990).

Frutex "mallee" vel arbor "mallet" ad *Eucalyptum* seriem *Tetrapteras* Blakely pertinens, ad 4 m alta cortice praecipue laevi interdum taeniformi. Folia adulta parva, angusta, ferentia erecta. Inflorescentiae axillares, erectae vel pendulae, 3 vel 7-florae, alabastris pedicellatis. Alabastra fructusque aliquantam leviter costati.

*Typus:* 1.8 km W of Jerramungup North Road on Rabbit Proof Fence Road, 33°50'S, 118°55'E, 21 July 1988, *M.I.H. Brooker* 10000 & *C.J. Ranford* (holo: PERTH; iso: AD, CANB, MEL, NSW).

*Mallee* or mallet to 4 m tall usually with grey, creamy white or pale coppery smooth bark, occasionally ribbony on the stems. *Pith* glandular at some nodes, i.e. variable in this character. *Seedling leaves* petiolate, opposite for 1(2) nodes. *Juvenile leaves* petiolate, alternating, ovate to lanceolate, to 7 x 2.5 cm, dull, blue-green. *Adult leaves* petiolate, alternating, narrowly lanceolate, 5-7 x 0.8-1 cm, concolorous, glossy, green; reticulation dense or sometimes obscure and broken, with numerous

irregular, apparently intersectional oil glands. *Inflorescences* axillary, unbranched, 3- or 7-flowered; peduncles slightly flattened, widening towards the top, to 1.5 cm long. *Buds* pedicellate, usually slightly ribbed, hypanthium truncate-pyriform or cylindrical, operculum strongly beaked with narrow often curved extension, to 1.4 x 0.5 cm. *Stamens* inflexed, all fertile; anthers versatile, dorsifixed, oblong, opening by longitudinal slits. *Flowers* pale yellow. *Fruits* pedicellate, cupular, to 1 x 0.9 cm, often slightly contracted at rim; disc descending; valves 3(4), to rim level. *Seed* greyish black, irregularly flattened with a prominent flange all around, slightly ribbed on the ventral side, hilum ventral.

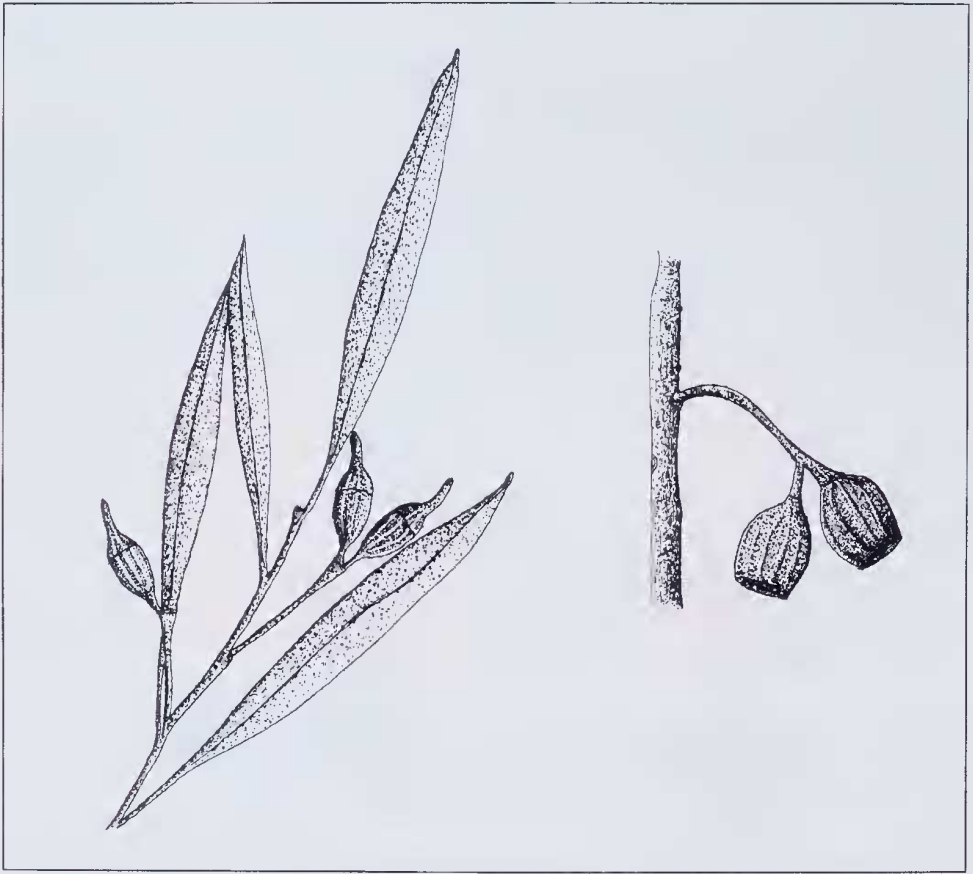


Figure 25. *E. captiosa* - buds, fruit and leaves (MIHB 10001)

*Other specimens examined.* WESTERN AUSTRALIA: 10 miles E of Jerramungup, Oct. 1969, A.M. Baird s.n. (PERTH); 39 km SW of Fitzgerald, Ravensthorpe-Ongerup road, 27 Aug. 1974, A.C. Beauglehole 49227 (PERTH); 9.2 km W of Ravensthorpe-Lake King Road on Aerodrome Road, 16 July 1987, M.I.H. Brooker 9721 (AD, CANB, MEL, NSW, PERTH); Mallee Road, 1.8 km NE of Lake North Road, 16 July 1987, M.I.H. Brooker 9723, 9724 (AD, CANB, MEL, NSW, PERTH); type locality, 21 July 1988, M.I.H. Brooker 10001 (AD, CANB, MEL, NSW, PERTH); 100 km W of Ravensthorpe, 4 Nov. 1978, R.J. Cranfield 992 (PERTH); 7 miles E of Ongerup, 22 Aug. 1969, H. Demarz 1565 (PERTH); 12 miles W of Ongerup, 13 Mar. 1957, J.W. Green 1178 (PERTH); 14 miles E of Ongerup, 3 Aug. 1957, J.W. Green (PERTH); 10.2 miles E of Jerramungup on road to Ravensthorpe, 21 Mar. 1970, M.D. Tindale & B.R. Maslin T252 (PERTH).

*Distribution.* Tambellup to Ravensthorpe, particularly the upper Gairdner River catchment, Western Australia (Figure 21).

*Conservation status.* Common and widespread.

*Flowering period.* July.

*Etymology.* From the Latin *captiosus* - deceptive, in reference to the fine-leaved crown appearance which is quite unlike that of the related *E. incrassata* Labill.

*Notes.* *E. captiosa* is the westernmost taxon of the series and is readily seen on roadsides in sandy country north-east and north of the Stirling Range.

## 27. *Eucalyptus dolichorhyncha* (Brooker) Brooker & Hopper, stat. nov.

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 359 (1990).

*Basionym:* *E. forrestiana* Diels subsp. *dolichorhyncha* Brooker, J. Roy. Soc. W. Austral. 56: 74 (1973).  
*Type:* Grasspatch, 16 March 1957, J.W. Green 1252 (PERTH).

*Notes.* This taxon was distinguished by the beaked operculum, shorter pedicels, and smaller buds and fruit compared with the typical subspecies. Robinson (1984) demonstrated that *E. forrestiana* subsp. *dolichorhyncha* has narrower adult leaves (1.7-2 cm), wider wings to the bud (0.4-0.5 cm) and lacked ribs between the four wings compared with the typical subspecies (leaves 2-2.5 cm wide, wings 0.3-0.4 cm deep). From recent field examinations of the two subspecies, we agree with Robinson's findings on morphology but consider that *dolichorhyncha* is specifically distinct. *E. forrestiana sens. strict.* has a wide east-west distribution from the Cascades area east to the vicinity of Mt Ney. *E. dolichorhyncha* has a more restricted distribution to the north from Truslove to Salmon Gums.

We do not agree with Robinson (1984) and Green (1985) in their treatment of *E. stoatei* as a subspecies of *E. forrestiana*. The phenogram in Robinson (1984) shows that populations of *E. stoatei* are relatively uniform and distinct from those of *E. forrestiana*. Specific rank rather than subspecific is favoured here.

## *Eucalyptus* ser. *Ovulares* Brooker, Brunonia 4:1 (1981).

*Type:* *E. ovularis* Maiden & Blakely

The *E. ser. Ovulares* belong in the informal *E.* subgenus *Symphyomyrtus* and is diagnosed as follows: tree or mallee, bark rough rarely smooth, pith of branchlets glandular although glands often obscure, cotyledons reniform, juvenile leaves petiolate, adult leaves glossy green rarely bluish, in most species densely glandular, stamens inflexed, ovules in 4 vertical rows, fruit often with prominent thin rim, seeds brown, shallowly reticulate.

Key to taxa of *E. ser. Ovulares*

1. Bark smooth or rough at butt only
  2. Adult leaves dull to slightly glossy, light green to blue-green; fruit to 1 x 1 cm ..... *E. cyclostoma*
  2. Adult leaves glossy green
    3. Bud constricted at join of operculum ..... 29. *E. exigua*
    3. Bud not constricted at join
      4. Adult leaves densely reticulate, oil glands obscure ..... *E. oraria*
      4. Adult leaves with obscure reticulation, oil glands distinct, very numerous ..... *E. cylindrocarpa*
1. Bark rough over part or whole of stems or trunk
  5. Bud hypanthium widest towards base ..... *E. ovularis*
  5. Bud hypanthium not widest towards base
    6. Bud constricted at join of operculum ..... *E. brachycorys*
    6. Bud not constricted
      7. Adult leaves with prominent secondary venation ..... *E. baudiniana*
      7. Adult leaves with obscure secondary venation and very numerous oil glands
        8. Buds pyriform
          9. Buds to 0.5 x 0.3 cm; fruits to 0.5 x 0.3 cm ..... *E. myriadena* subsp. *myriadena*
          9. Buds to 0.3 x 0.15 cm; fruits to 0.2 x 0.2 cm ..... 30. *E. myriadena* subsp. *parviflora*
        8. Buds double-conic, rarely ovoid ..... 28. *E. aequioperta*

**28. *Eucalyptus aequioperta* Brooker & Hopper, sp. nov. (Figure 26)**

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 369 (1990).

Frutex "mallee" affinis *Eucalypto ovulari* Maiden & Blakely a qua foliis juvenilibus adultisque majoribus, hypanthio alabastri fructusque obconico vel hemisphaerico differt.

*Typus*: 3.5 km E of Mt Walker, 20 March 1985, 32°04'S, 118°47'E, *M.I.H. Brooker* 8891 (holo: PERTH; iso: CANB, MEL, NSW).

*Mallee* or rarely *tree* to 8 m tall with rough bark on lower half of stems. Forming *lignotubers*. *Seedling leaves* petiolate, remaining decussate for about 3 pairs, elliptical to ovate, to 4.5 x 2 cm, blue-green, dull. *Adult leaves* alternating, petiolate, lanceolate, to 11 x 1 cm, concolorous, glossy, green; reticulation moderate to dense, more or less obscured by numerous large oil glands. *Inflorescences* axillary, unbranched, 7- to 11-flowered; peduncles slender, to 1.6 cm long. *Buds* pedicellate, "egg-in-egg cup shaped" or broadly fusiform, to 0.6 x 0.7 cm, bi-operculate; inner operculum slightly beaked. *Stamens* inflexed in bud, all fertile; anthers versatile, dorsifixed, oblong, opening by longitudinal slits. *Flowers* not seen. *Ovules* in 4 vertical rows. *Fruits* shortly pedicellate, cupular to slightly obconical, to 0.5 x 0.4 cm; rim thin; disc descending; valves 3(4), to rim level or slightly exserted. *Seed* compressed-ovoid, brown, with shallow distinct reticulum.



*Other specimens examined.* WESTERN AUSTRALIA: 49 km NW of Hyden towards Narambeen, 37°08'S, 118°35'E, 4 Oct. 1975, *M.I.H. Brooker* 4999 and *D. Blaxell* (CANB, NSW, PERTH); 34 km from Narambeen on Hyden road, 12 Aug. 1979, *M.I.H. Brooker* 6326 (CANB, PERTH); 13.3 km W of Bullabulling, 20 Aug. 1979, *M.I.H. Brooker* 6397 (CANB, PERTH); 56 km S of Widgiemooltha, 21 Aug. 1979, *M.I.H. Brooker* 6412 (CANB, PERTH); Sandmine NW of Gnarlbine Rock, c. 32 km SW of Coolgardie, 23 Aug. 1979, *M.I.H. Brooker* 6467 (CANB, PERTH); 128 km W of Kalgoorlie, 14 Mar. 1984, *M.I.H. Brooker* 8490 (CANB, NSW, PERTH); 4.6 and 3.5 km E of Mt Walker, 32°04'S, 118°47'E, 19 Dec. 1984, *M.I.H. Brooker* 8769, 8770 (CANB, NSW, PERTH); 12.2 km SW of Bullabulling, 31°05'S, 120°48'E, 27 June 1987, *M.I.H. Brooker* 9699 & *S.D. Hopper* (CANB, NSW, PERTH); 4 km E of Corrigin-Bruce Rock road on Yelberrin road, 23 Aug. 1988, *M.I.H. Brooker* 10044 (CANB, PERTH); c. 3 km E of Mt Walker, 23 Aug. 1988, *M.I.H. Brooker* 10048 (CANB, PERTH); Church Road, E of Narambeen, 14 Sep. 1990, *M.I.H. Brooker* 10542 (CANB, MEL, NSW, PERTH); c. 30 km SSW of Coolgardie, 3 km NW of Gnarlbine, 31 Jan. 1979, *M.D. Crisp* 5610 (CBG, PERTH).

*Distribution.* From north-east of Corrigin towards Coolgardie, Western Australia (Figure 21).

*Conservation status.* Poorly known and in need of further survey.

*Flowering period.* Not known.

*Etymology.* From the Latin *aequi* - equal and *opertus* - cover, referring to the operculum shape, in relation to the hypanthium.

*Notes.* A little-known taxon readily seen at the type locality and probably occurring widely scattered to the north-east towards Coolgardie.

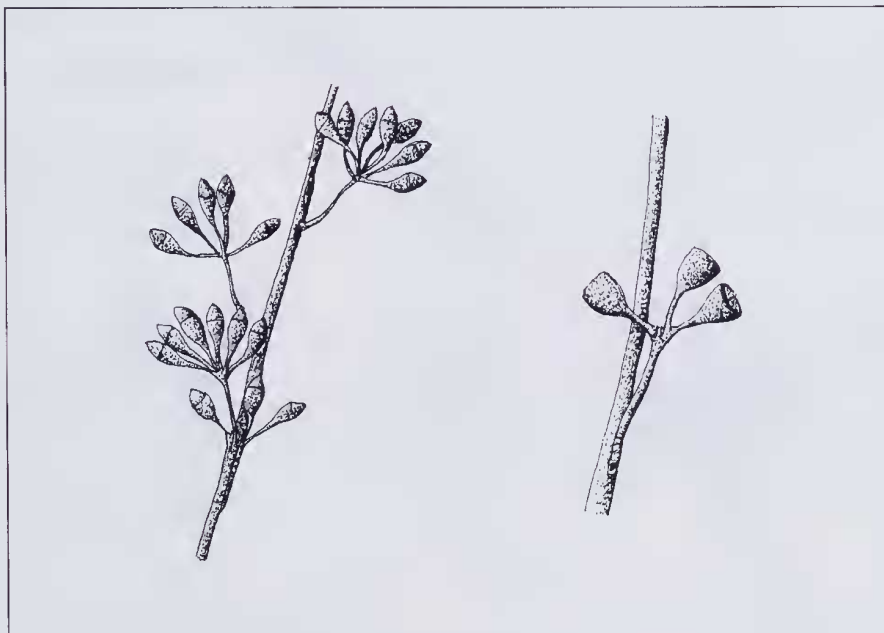


Figure 26. *E. aequioperta* - buds and fruit (MIHB 8891) (x1.25)

**29. *Eucalyptus exigua* Brooker & Hopper, sp. nov. (Figure 27)**

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 373 (1990).

Frutex "mallee" *Eucalypto brachycorytho* Blakely affinis sed statura inferiore, cortice laevi, et foliis plantularum alabastris fructibusque parvioribus differt.

*Typus*: 22 km W of Mt Day Road on Hyden-Norseman track, 32°15'S, 120°19'E, 7 Nov. 1983, M.I.H. Brooker 8359 (holo: PERTH; iso: CANB, NSW).

*Mallee* with affinity to *Eucalyptus brachycorys* Blakely but differing in the lower stature, smooth bark and smaller seedling leaves, buds and fruit.

*Mallee* to 3 m tall with grey or whitish grey smooth bark. *Seedling leaves* petiolate, decussate, remaining opposite for 3-4 pairs, ovate, to 4 x 1.5 cm, light green. *Juvenile leaves* petiolate, alternating, narrowly lanceolate, to 6 x 0.8 cm, light green. *Adult leaves* petiolate, alternating, narrowly lanceolate, to 9 x 1 cm, concolorous, glossy, green; side veins thin, obscure; reticulation absent and with very numerous island oil glands. *Inflorescences* axillary, unbranched, 7-flowered; peduncles more or less terete, to 1.8 cm long. *Buds* on distinct pedicels, more or less cylindrical, to 0.5 x 0.4 cm; operculum flattened - hemispherical or pileate, with the bud markedly constricted at the join of hypanthium and operculum. *Stamens* inflexed, all fertile; anthers versatile, sub-basifixed, oblong, opening by longitudinal slits. *Flowers* not seen. *Ovules* in 4 vertical rows. *Fruits* pedicellate, cupular and slightly constricted at the rim, to 0.6 x 0.6 cm; rim thin; disc obliquely on vertically sloping downwards; valves 4, to rim level. *Seed* brown, flattened-ovoid, with a distinct shallow reticulum, hilum ventral.

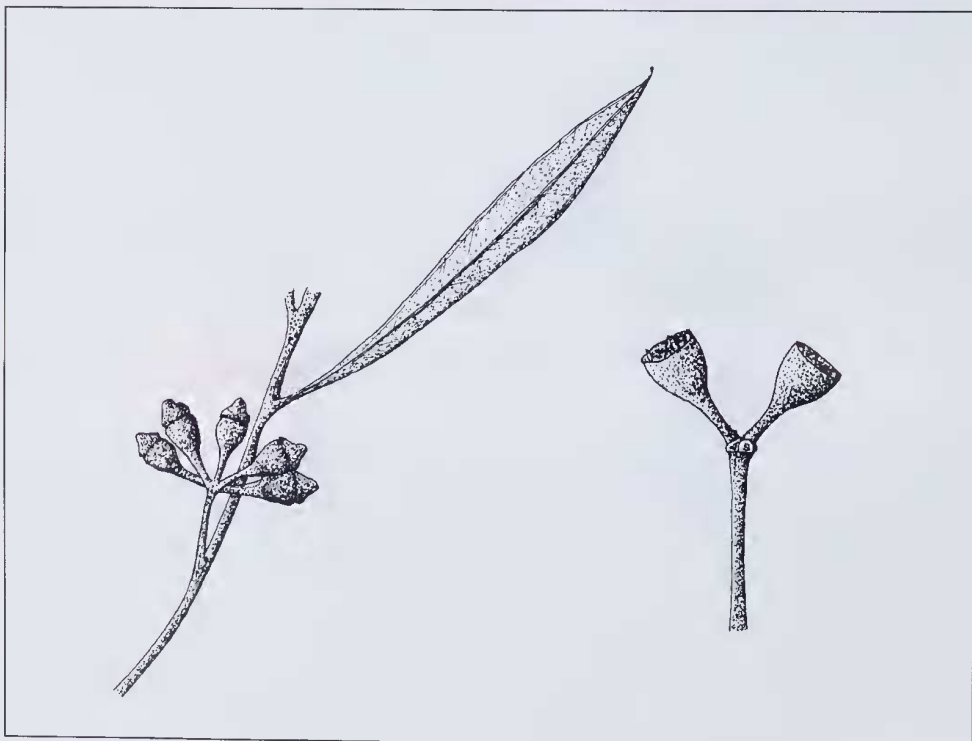


Figure 27. *E. exigua* - buds (actual size) (MIHB 10013) and fruit (x1.5) (MIHB 8900)

*Other specimens examined.* WESTERN AUSTRALIA: 93 km E of Hyden on Norseman track, 3 Oct. 1975, *M.I.H. Brooker* 4984 (CANB, PERTH); 52 km E of cross-roads on Hyden-Norseman track, 6 April 1985, *M.I.H. Brooker* 8900 (CANB, NSW, PERTH); NE of Lake Cronin, 100 m E of Caravan, 21 October 1986, *M.I.H. Brooker* 9483 (AD, CANB, MEL, NSW, PERTH); 11.8 km S of Cross Roads, 22 July 1988, *M.I.H. Brooker* 10013 (AD, CANB, MEL, NSW, PERTH); 142.7 km W of Coolgardie-Norseman Road on track to Hyden, 7 Nov. 1983, *K. Hill* 630 (CANB, NSW, PERTH); 1.8 km N of main road on old track, 8.8 km E of Lake Cronin, *S.D. Hopper* 5426 (PERTH); near Lake Cronin, 6 Feb. 1981, *G.J. Keighery* 3772 (PERTH); Lake Cronin area, 16 Feb. 1967, *A. Kessel* 567 (PERTH); 35 km SW of McDermid Rock, c. 117 km W of Norseman, 15 July 1979, *K.R. Newbey* 5299 (PERTH); 1 km NE of Lake Cronin, c. 86 km E of Hyden, 19 July 1981, *K.R. Newbey* 8324 (PERTH).

*Distribution.* From the Cross Roads area east of Hyden eastwards towards Mt Day, Western Australia (Figure 21).

*Conservation status.* Poorly known and in need of further survey.

*Flowering period.* Not known.

*Etymology.* The name alludes to the distinction from the nearest allied species, *E. brachycorys*, Latin - *exiguus* small, feeble.

*Notes.* Known from three localities only, in an area not well surveyed botanically. It occurs in a small pure stand at the Lake Cronin site.

### 30. *Eucalyptus myriadena* Brooker subsp. *parviflora* Brooker & Hopper, subsp. nov. (Figure 28)

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 419 (1990).

A subspecies typica alabastris (ad 0.3 x 0.15 cm) fructibusque (ad 0.2 x 0.2 cm) minimis differt.

*Typus:* 9.5 km S of Cross Roads, E of Hyden, on Varley Road, 32°29'S, 119°45'E, 22 July 1988, *M.I.H. Brooker* 10012 & *C.J. Ranford* (holo: PERTH; isc: AD, CANB, MEL, NSW).

It differs from the typical subspecies by the smaller buds (to 0.3 x 0.15 cm) and fruit (to 0.2 x 0.2 cm).

*Other specimens examined.* WESTERN AUSTRALIA: 4.6 km N of Cross Roads, E of Hyden (32°22'S, 119°44'E), 28 Jan. 1987, *M.I.H. Brooker* 9571 (AD, CANB, MEL, NSW, PERTH); 5.2 km N of Cross Roads, 24 Aug. 1988, *M.I.H. Brooker* 10066 (CANB, PERTH, NSW, MEL, AD); 542 m.p. near Cross Roads to Marvel Loch, 8 Dec. 1968, *S. Chambers* 179 (PERTH).

*Distribution.* Restricted to a small area north and south of the Cross Roads east of Hyden, Western Australia (Figure 21).

*Conservation status.* Poorly known and in need of further survey.

*Flowering period.* Not known.

*Etymology.* From the Latin - *parviflorus*, small-flowered. This subspecies has the smallest buds and fruits of all eucalypts in the southern half of Western Australia.

*Notes.* The new subspecies occurs within the distribution of but not sympatrically with the typical form. Little exploration for *Eucalyptus* has been made away from the principal roads in its vicinity.

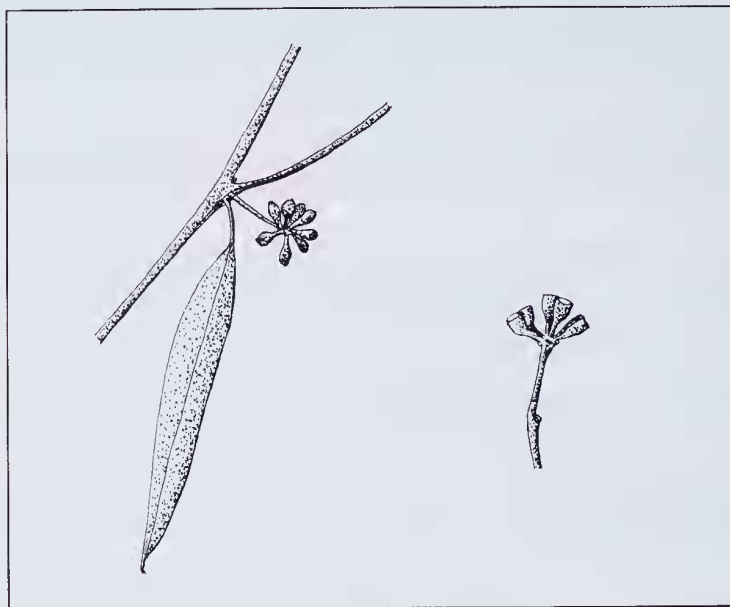


Figure 28. *E. myriadena* subsp. *parviflora* - buds (MIHB 10066) and fruit (MIHB 10012)

**Eucalyptus ser. *Exsertae*** Blakely, "A Key to the Eucalypts" 29: 128 (1934).

*Type:* *E. exserta* F. Muell.

The series *Exsertae* belongs in the informal *E.* subgen. *Symphyomyrtus* and is diagnosed by: tree or mallee, cotyledons reniform, pith of branchlets not glandular, juvenile leaves petiolate, inflorescences axillary, outer stamens erect in all but one species, ovules in 6 vertical rows, disc of fruit prominent, level or ascending, seed elongately cuboid with hilum on small face (from apparently anatropous ovules).

The *E.* ser. *Exsertae* (the eastern red gums (Boland *et al.* 1984)) has only two species in Western Australia and it is sufficient in this paper to contrast only these taxa. *E. camaldulensis* is predominantly smooth-barked and has seed with a smooth yellow seedcoat while *E. rudis* is predominantly rough-barked and has dark brown to black seed with a finely pitted seedcoat.

#### Key to the subspecies of *E. rudis*

1. Buds to 1.2 cm long, fruits to 0.9 cm wide ..... *E. rudis* subsp. *rudis*
1. Buds to 1.5 cm long, fruits to 1.4 cm wide ..... 31. *E. rudis* subsp. *cratyantha*

**31. *Eucalyptus rudis* Endl. subsp. *cratyantha* Brooker & Hopper, subsp. nov. (Figure 29)**

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 419 (1990).

A subspecie typica alabastris (ad 1.5 cm longis), fructibusque (ad 1.4 cm latis) majoribus, valvis fructum numerosioribus, et plerumque pedicellis longioribus (ad 0.7 cm longis) differt.

*Typus:* On Moses Rock Road, 33°44'S, 114°59'E, 10 May 1986, S.D. Hopper 4825 (holo: PERTH).

It differs from the typical subspecies in the larger buds (to 1.5 cm long) and fruits (to 1.4 cm wide), the greater number of valves to the fruit (5 or 6) and the usually longer pedicels (to 0.7 cm long).

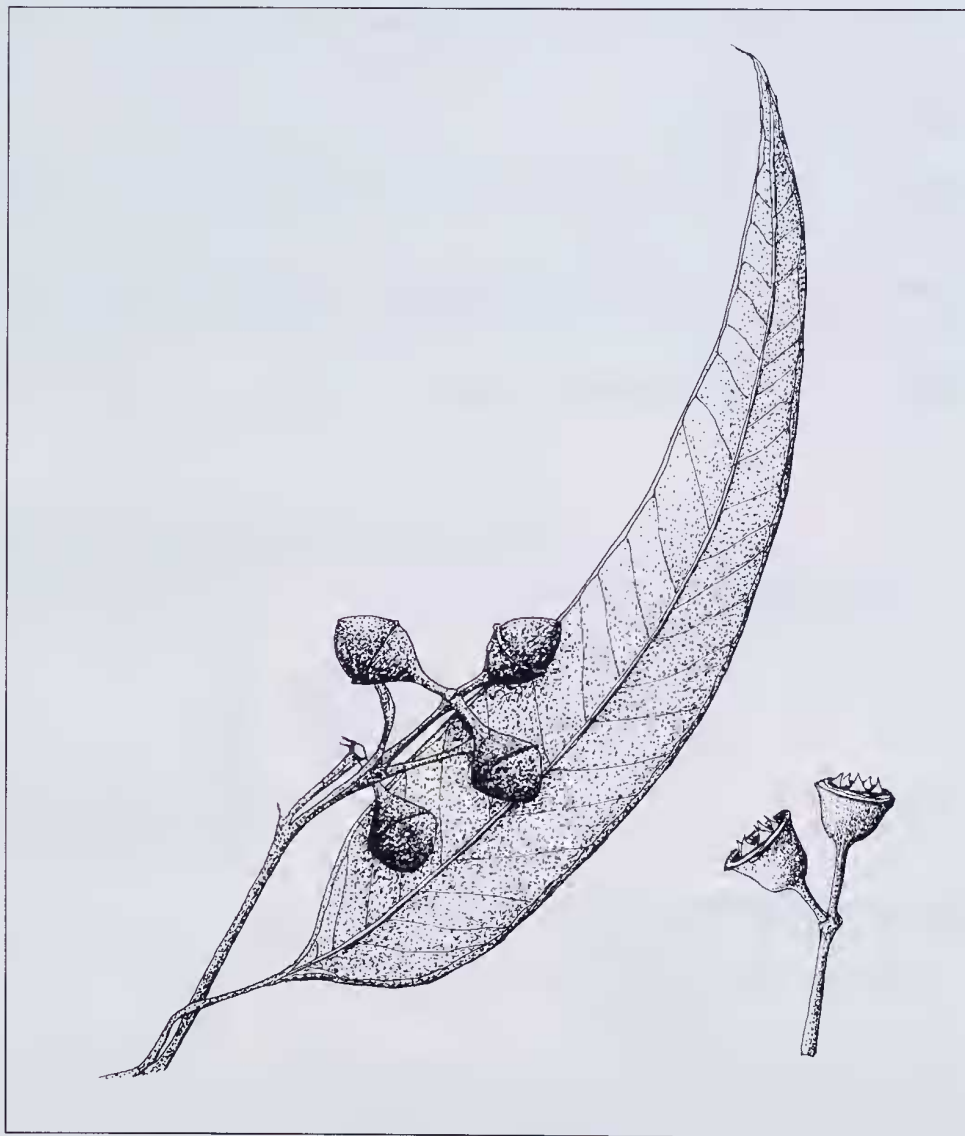


Figure 29. *E. rudis* subsp. *cratyantha* - buds (SDH 4820) and fruit (MIHB 9801)



*Other specimens examined.* WESTERN AUSTRALIA: Murray River flats between Pinjarra and Mandurah, 32°35'S, 115°50'E, 13 August 1979, *M.I.H. Brooker* 6333 (CANB, NSW, PERTH); 6.4 km along Wonnerup Road from Wonnerup South Road, E of Busselton, 33°39'S, 115°27'E, 6 November 1987, *M.I.H. Brooker* 9801 & *S.D. Hopper* (AD, CANB, MEL, NSW, PERTH); Meelup Beach, c. 500 m from sea at foot of coastal slopes, 33°52'S, 114°59'E, 8 May 1986, *S.D. Hopper* 4820, 4821 (PERTH); Eagle Bay (Fern Road, 3 km N of Meelup Road, 26 Oct. 1988, *L.A.S. Johnson* 9134 & *B. Briggs* (NSW, PERTH); Fern Road, Eagle Bay, Cape Naturaliste, 12 August 1986, *G.J. Keighery* 8290 (PERTH); bank of Collie River, 7 August 1980, *J. Koch* 442 (PERTH).

*Distribution.* Coastal and subcoastal from Mandurah and Pinjarra south and south-west towards Cape Naturaliste, Western Australia (Figure 21).

*Conservation status.* Poorly known and in need of further survey. Priority 3 in Hopper *et al.* (1990) - reserve flora list.

*Flowering period.* Not known.

*Etymology.* From the Greek *craty* - strong and *anthos* - flower in reference to the flower buds being larger than those of the typical subspecies.

*Notes.* This subspecies is the south-western form of *E. rudis*. It may be reduced to a mallee or small tree on stony sites.

**Eucalyptus** ser. **Lucasianae** Chippendale, Fl. Australia 19:500 (1988).

*Type:* *E. lucasii* Blakely

The *E. series* *Lucasianae* belongs in the informal *E. subgenus* *Symphyomyrtus* and is diagnosed as follows: mallee, cotyledons reniform, pith of branchlets not glandular, juvenile leaves petiolate, inflorescences arranged on leafless ends of branchlets with a terminal usually aborting vegetative bud, few axillary inflorescences, outer stamens without anthers.

#### Key to the subseries of *E. ser. Lucasianae*

1. Bark smooth; adult leaves dull ..... *E. subser. Lucasianae*
1. Bark rough; adult leaves glossy ..... *E. subser. Cupreanae*

**Eucalyptus** subser. **Cupreanae** Brooker & Hopper, subser. nov.

A subserie typica cortice fibroso et foliis adultis nitentibus differt.

*Typus:* *E. cuprea* Brooker & Hopper

**32. Eucalyptus cuprea** Brooker & Hopper, sp. nov. (Figure 30)

Brooker & Kleinig, "Field Guide to Eucalypts" 2: 400 (1990).

Frutex "mallee" ad 4 m altus cortice aspero cinereo in dimidio inferiore caulium, caulibus superis laevibus cupreis. Lignotuberum formans. Cotyledones reniformes vel bilobae. Folia plantularum, decussata, petiolata, ovata, ad 6 x 3 cm, hebetia, thalassica. Folia adulta alternantia, petiolata, lanceolata, ad 14 x 2 cm, concoloria, nitentia, viridia. Inflorescentiae apparenter terminales. Pedunculi ad 1 cm longi. Alabastra immatura cylindrica, apparenter sessilia, matura pedicellata, clavata, ad 0.6 x 0.4 cm; operculum exterius exutum in alabastro praecoci, interius conicum vel hemisphaericum. Stamina valde inflexa, exteriora sine antheris. Antherae vel versatiles vel adnatae. Ovarium (4)5-loculare; ovula verticaliter 4-seriata. Fructus pedicellati, cupulares, ad 0.5 x 0.4 cm.

*Typus:* 9.6 km N of Murchison River of NW coastal highway, 27°45'S, 114°40'E, 28 Aug. 1984, M.I.H. Brooker 8635 (holo: PERTH; iso: CANB, NSW).

*Mallee* to 4 m tall with rough flaky or fibrous grey bark on lower half of stems, smooth coppery or grey above. Forming *lignotubers*. *Seeding leaves* decussate, remaining opposite for 3-4 pairs, petiolate, ovate, to 6 x 3 cm, blue-green, dull. *Juvenile leaves* alternating, petiolate, ovate, to 10 x 6 cm. *Adult leaves* alternating, petiolate, lanceolate, to 14 x 2 cm, concolorous, glossy, green; reticulation dense, incomplete, with scattered to very sparse intersectional or island oil glands. *Inflorescences* apparently terminal. *Peduncles* slender, to 1 cm long. *Immature buds* apparently sessile, cylindrical, with prominent scar caused by very early loss of outer operculum; mature buds distinctly pedicellate, clavate, to 0.6 x 0.4 cm; inner operculum conical to hemispherical. *Stamens* strongly inflexed, outer ones without anthers. Fertile *anthers* sub-versatile to adnate, cuboid to irregular in shape, opening by lateral pores; *flowers* white. *Ovary* (4) 5-locular; ovules in 4 vertical rows. *Fruits* distinctly pedicellate, cupular, to 0.5 x 0.4 cm; valves below rim level. *Seed* compressed-ovoid, grey-brown, with distinct shallow reticulum.

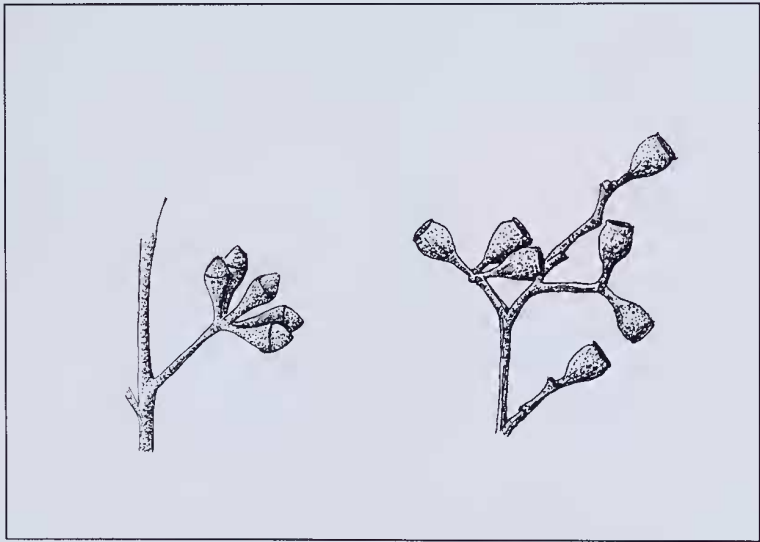


Figure 30. *E. cuprea* - buds (MIHB 8635) and fruit (MIHB 9406)

*Other specimens examined.* WESTERN AUSTRALIA: 15 km along the Northampton and Lyndon Road, 1952, *G.Brockway s.n.* (PERTH); 14 miles N of T.O. to Kalbarri on northern highway, 9 January 1970, *M.I.H. Brooker* 2392 (CANB, PERTH); 29.8 km N of Northampton, 25 May 1983, *M.I.H. Brooker* 8121 (CANB, NSW, PERTH) and 27 October 1983 (CANB, NSW, PERTH); 9.6 km N of Murchison

River crossing on highway, 25 May 1983, *M.I.H. Brooker* 8124 (CANB, NSW, PERTH) and 27 October 1983, *M.I.H. Brooker* 8305 (CANB, NSW, PERTH); 29.6 N of Northampton, 27 Oct. 1983, *M.I.H. Brooker* 8304 (CANB, PERTH); Nanson Road, E side of hill, 11 June 1985, *M.I.H. Brooker* 9037 (CANB, NSW, PERTH); Morseby Range, 4 November 1985, *M.I.H. Brooker* 9062 (CANB, NSW, PERTH); Nanson Road, 12 March 1986, *M.I.H. Brooker* 9198 (CANB, NSW, PERTH); 2 km on Ogilvy West Road, E of Chillinup Road, 8 May 1986, *M.I.H. Brooker* 9275 (CANB, PERTH); 3.8 km W of Highway 1 on Ogilvie West Road, 22 July 1986, *M.I.H. Brooker* 9406 (CANB, NSW, PERTH); Hutt River between Northampton and Lyndon, September 1959, *C.A. Gardner s.n.* (PERTH); 9.6 km N of Murchison River bridge, 27°45'S, 114°40'E, 25 May 1983, *S.D. Hopper* 2750 (PERTH).

*Distribution.* From the Moresby Range to north of the Murchison River, Western Australia (Figure 21).

*Conservation status.* Vulnerable, and declared as Rare Flora (species no. 157 in Hopper *et al.* (1990)).

*Flowering period.* October.

*Etymology.* The name refers to the seasonal colour of the smooth bark, Latin *cupreus* - coppery.

*Notes.* *E. cuprea* belongs in the informal section *Adnataria* Pryor & Johnson. This section is overwhelmingly eastern in distribution and therefore probably in origin. Few species in the group penetrate into the southern half of Western Australia. These are *E. coolabah* Blakely & Jacobs var. *rhodoclada* Blakely along the Murchison River, *E. intertexta* R.T. Baker to south and south-west of Warburton and four endemics, viz. *E. petraea* Carr & Carr which is widespread in the wheatbelt and goldfields near granite rocks, *E. lucasii* Blakely in the northern goldfields, *E. absita* Grayling & Brooker, a rare species in the Badgingarra area and *E. cuprea*.

### Acknowledgements

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   ser. *Loxophlebae* 13  
   ser. *Lucasiana* 64  
   ser. *Micrantherae* 24  
   ser. *Occidentales* 3  
   ser. *Orbifoliae* 40  
   ser. *Ovulares* 57  
   ser. *Porantherae* 45  
   ser. *Rufispermae* 47  
   ser. *Subulatae* 28  
   ser. *Tetrapterae* 55  
   ser. *Torquatae* 53  
   subser. *Bakerianae* 25  
   subser. *Cupreanae* 65  
   subser. *Curviptera* 31  
   subser. *Decipientes* 18  
   subser. *Inflexae* 31  
*Eucalyptus aequioperta* 58  
*Eucalyptus angularis* 8  
*Eucalyptus articulata* 14  
*Eucalyptus aspersa* 29  
*Eucalyptus captiosa* 56  
*Eucalyptus communalis* 19  
*Eucalyptus crucis*  
   subsp. *praecipua* 41  
*Eucalyptus cuprea* 65  
*Eucalyptus decipiens*  
   subsp. *adesmophloia* 22  
   subsp. *chalara* 23  
*Eucalyptus dolichorhyncha* 57  
*Eucalyptus dolorosa* 6  
*Eucalyptus ebbanoensis*  
   subsp. *photina* 2  
*Eucalyptus exigua* 60  
*Eucalyptus georgei*  
   subsp. *fulgida* 47  
*Eucalyptus glomerosa* 32  
*Eucalyptus impensa* 35  
*Eucalyptus indurata* 26  
*Eucalyptus kingsmillii*  
   subsp. *alatissima* 38  
*Eucalyptus leprophloia* 12  
*Eucalyptus macrocarpa*  
   subsp. *elachantha* 37  
*Eucalyptus marginata*  
   subsp. *elegantella* 4  
   subsp. *thalassica* 5  
*Eucalyptus myriadena*  
   subsp. *parviflora* 61  
*Eucalyptus obesa* 21  
*Eucalyptus olivina* 45  
*Eucalyptus petrensis* 17  
*Eucalyptus polita* 51  
*Eucalyptus quadrans* 43  
*Eucalyptus rudis*  
   subsp. *cratyantha* 63  
*Eucalyptus surgens* 53  
*Eucalyptus tenuis* 49  
*Eucalyptus zopherophloia* 10